Vol. XIX, No. 6 JANUARY, 1948

THE TOOL ENGINEER

REG. U.S. TRADE MARK

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

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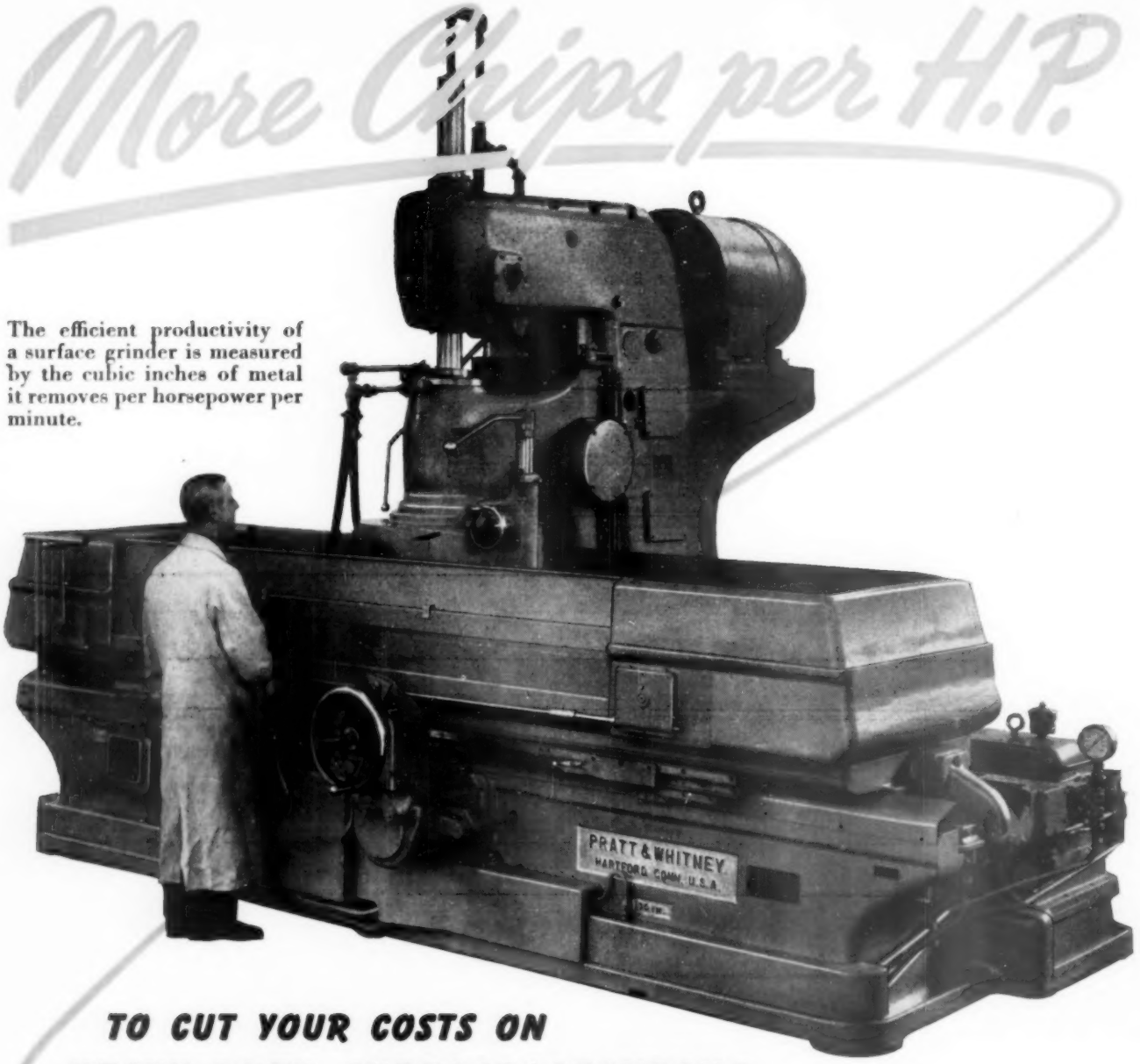
Behind every manufactured product is the tool engineer

More Chips per H.P.

The efficient productivity of a surface grinder is measured by the cubic inches of metal it removes per horsepower per minute.



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This P&W Heavy-Duty Hydraulic Vertical Surface Grinder has all the requisites for efficient productivity. It will remove metal at the *highest rate* and at the *lowest cost* per horsepower per cubic inch. It has ample power (100 H.P.) needed to give the 30″ grinding wheel its full chance to cut, either roughing or finishing, without slowing down from full efficient cutting speed. It has ample, smooth, hydraulic power (15 H.P.) to drive the work past the wheel . . . with the *edge* of the wheel doing the cutting. The table speed is always *right* for the job. The machine is heavy and rigid (19 tons) to hold its built-in accuracy intact under constant heavy-duty service. That's why its users consider this new 30″ Surface Grinder a *paying* investment.

This is the largest of P&W's line of surface grinders . . . all designed the way our many years of research and user contact have proved best. Write today for complete literature.

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The Tool Engineer

Official Publication: American Society of Tool Engineers

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Jan., 1948

Vol. XIX, No. 6

We Need Industrial Statesmanship!

VICE PRESIDENT THOMAS R. MARSHALL once said, while presiding over the U. S. Senate during a debate on the needs of the country, that "what this country needs is a good five-cent cigar."

However, the requirements of society have changed vastly since Tom Marshall's time. Instead of the simple expedient of a good five-cent cigar, what we need most today is sound, intelligent, well-advised industrial statesmanship. This leadership, or statesmanship, if you please, must be trained and schooled in our social and economic needs even more thoroughly than many nations have trained their diplomatic representatives. Industrial statesmanship must become a career for the most able of our thinkers and leaders.

Our need for these socially-conscious industrial diplomats becomes all the more pronounced when we realize that the eventual outcome of this so-called Twentieth Century Revolution is still uncertain. The clouds of misunderstanding have not risen sufficiently for the issues to be clearly and wholly understood. It is essential, therefore, to employ a high order of statesmanship to codify the thinking of the many segments comprising our industrial democracy and to halt this revolution before it becomes one of bloodshed.

There is quite a normal tendency for the self-styled leaders in the camps of both labor and management to go off half-cocked. If these men were real industrial statesmen, they would first find out what the problems are, and then take time to figue out a sound course of strategy which would channel and implement action into intelligent and efficient patterns.

To a real strategist, for instance, it would be elementary that mass production is not achieved by machines alone, but by a combination of *men and machines*. Many men high in industry seem never to have learned this or to have let it escape their minds. It is a sad commentary that most of our executives have been selected purely on a basis of technical proficiency and knowledge . . . and exceedingly few of them have the slightest idea of the fundamental principles of human engineering. This is attested by the fact that we have achieved such a high degree of mechanical pefection and, at the same time, have made such little use of the abilities and capabilities of the men who man our machines.

Just one statistic bears out the validity of this statement. The Department of Labor has said that 216,000,000 man-days were lost between 1927 and 1941 as a result of strikes alone.

Production and industry, and finally the general public, had to absorb the expense of these work stoppages. An end can be put to such unnecessary interruptions of production and to the legion "isms" that peril our economic system by the application of intelligent public relations and industrial statesmanship.

The most rudimentary lesson in psychology should teach both industrial management and labor that we must advance and succeed by mutual cooperation. We cannot accomplish the task of production or achieve industrial harmony by the exercise of force. And just as surely as we continue to "pass the buck" to government, we will surrender a large measure of freedom, which will eventually lead to radical changes in our democratic social system.

It is evident that management has been criticized and accused unjustly in the vast majority of instances. It is, therefore, up to management to answer these criticisms and make satisfactory explanations of its conduct. Too often managements have failed to do this. An adverse judgment should not be allowed to go by default. These judgments can be remedied by sound and effective diplomacy. Nothing else will serve this need.

But it is essential that management, if it is to survive as such, direct as much attention toward providing incentives for human effort as it has in the past toward the development of mechanical factors. It is squarely up to industry, business and the professions to correct existing fallacies and irradicate the gnawing ideologies that are eating at the core of our progress in human relations. That takes intelligent industrial statesmanship.

W. B. Peirce

President 1947-48

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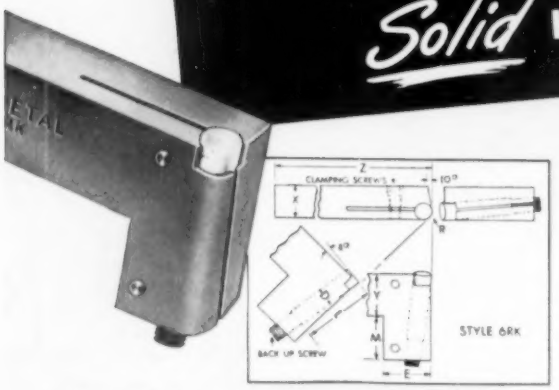
Another **KENNAMETAL** Development

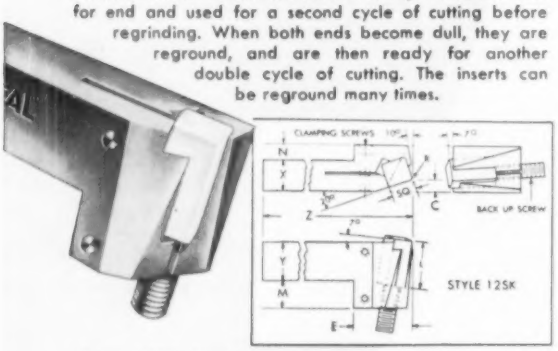
KENNAMATIC Tools

having CLAMPED-IN, INDEXABLE

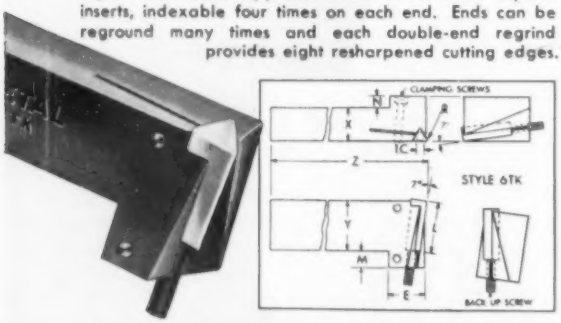
Solid KENNAMETAL Inserts



Style 6RK (and opposite hand 3RK) have cylindrical inserts that can be indexed several times, then turned end for end and used for a second cycle of cutting before regrinding. When both ends become dull, they are reground, and are then ready for another double cycle of cutting. The inserts can be reground many times.



Style 12SK (and opposite hand 11SK) have square inserts, indexable four times on each end. Ends can be reground many times and each double-end regrind provides eight resharpened cutting edges.



Style 6TK (and opposite hand 3TK) have triangular inserts, indexable three times on each end. Ends can be reground many times—and each double-end regrind provides six resharpened cutting edges.

Solid, Mechanically-Held Kennametal Inserts

Inserts are mechanically-held, *vertically*—best use is made of high compressive strength of Kennametal (up to 800,000 PSI); brazing strains are eliminated.

Indexable Cutting Edges

Can be indexed 6 to 12 times before regrinding. Indexing is a simple operation, and does not require changing tool holder.

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Few standard sizes can be used in a variety of tools and jobs—simplifies tool control; reduces toolroom stocks.

Simplified Regrinding

Resharpening merely requires squaring off both ends of insert, and grinding chip breaker if required—reduces load and confusion in grinding room.

Permanent Setting

Insert can be indexed or changed without changing tool holder setting—less set-up and machine down time.

The overall result of Kennamatic tooling is that higher production rates can be reached, and maintained, at much less cost. Let our engineers suggest suitable applications.

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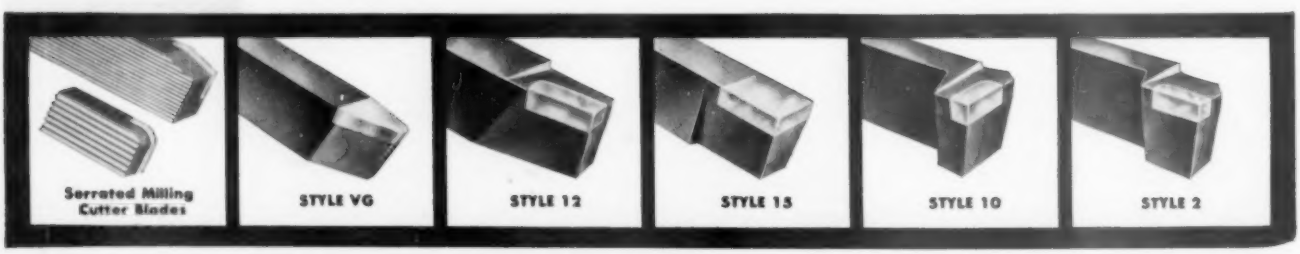
SUPERIOR CEMENTED CARBIDES
TRADE MARK REG. U. S. PAT. OFF.

KENNAMETAL Inc., LATROBE, PA.



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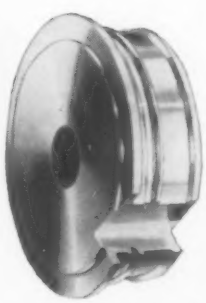
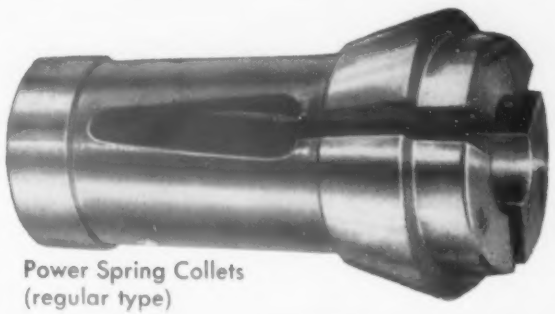
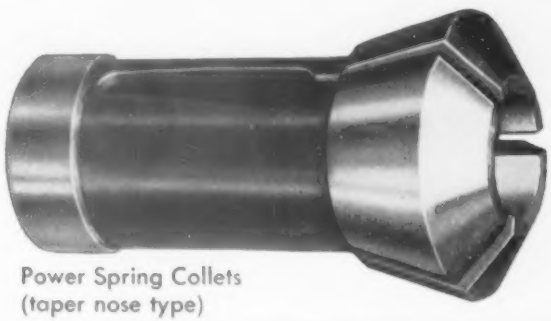


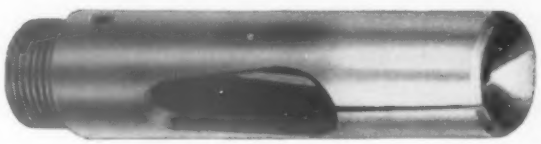
Circular Form Tools



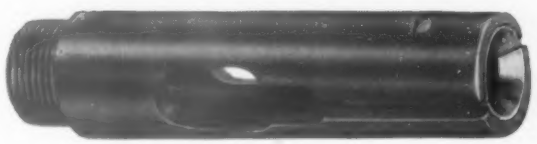
Power Spring Collets
(regular type)



Power Spring Collets
(taper nose type)



Feed Fingers (regular type)



Master Feed Fingers and Pads

Master Feed Fingers
with Adjustable Tension

Improved TECO CEMENTED CARBIDE *outproduces other carbides 3 to 10 times*

Another Typical Case

Part: Bearing Race (Railroad)
Material: S.A.E. 4320 (Rough forging)
Machine: Bullard 30" Cutmaster
Operation: Turning
Diameter: 8½"
Length of Cut: 8"
Depth of Cut: ¼"-⅜"
Feed: .021"
Speed: 370 f.p.m.
Pieces per grind: 50
Best previous carbide production: 15

TECO 254 Right Hand Blank used
TECO Grade C used

FIRST, Improved TECO produces so many more pieces and stays on the job so much longer, you consume fewer tools while greatly increasing production.

SECOND, you can generally use the *same grade* of Improved TECO carbide for turning, facing and boring—rough and finish cut—as well as precision boring and reasonable intermittent cutting. Type A-1 for cast iron, non-ferrous metals, etc. Type C for steels. When a TECO tool is exhausted for roughing, continue to use it for finishing, right down to the last grind. No need for large or complicated stocks—no wasted carbide.

Try Improved TECO on any carbide job. You'll get more pieces between grinds, more grinds per tool, less down time and lower tool cost. Send details of your machining problems for recommendation.

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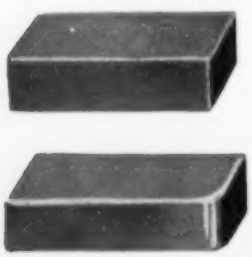
Manufacturers of
TECO CARBIDE BLANKS and TOOLS



All standard sizes and styles. When ordering any carbide tools specify "Teco —no substitute."

Improved
TECO
CEMENTED CARBIDE

Manufacturers of Tungsten Carbide—from ore to finished material—for over a quarter century.

5 COMPARATORS IN ONE!

A Simple, Rigid, Reliable Instrument With Many Uses

(Model 108)

Any #2 or #3 Size AGD Indicator With Standard Type Back May Be Used — Also the

Contact Pressure Can Be Regulated

Entirely Self-Contained

Anvils Rigidly Mounted On Heavy Base

Fine Adjustment Easily Made With Wing Handle

NEW STANDARD *Micronar* INDICATOR

A high amplification, high accuracy instrument, ideal for use on this Comparator.

ENGLISH MODEL	GRADUATED .00002" (CENTER SECTION)	RANGE .0018"
METRIC MODEL	GRADUATED .001 mm.	RANGE .04 mm.

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EXCLUSIVELY NEW!
THE HEALD MODEL 261

VERTICAL COLUMN
SURFACE GRINDER

➧ Furnishes more rigid support, smoother finish, larger capacity

HERE'S A *completely new* Rotary Surface Grinder—the Heald Model 261 with exclusive "vertical column" design. The wheel spindle is carried on a column, and the chuck table rests directly on the ways of the base. The vertical slide carrying the wheel is mounted on anti-friction bearings. Results: rigidity...accurate feeding...smoothest possible finish. Cuts are heavier . . . speeds and feeds more variable . . . setups quicker.

The new Model 261 follows the Heald principle of grinding with wheel periphery for a perfect concentric finish. Further research and development have added many other unique features. **For unparalleled accuracy:** wheel spindle runs on a film of oil. **For increased capacity:** work height and swivel angle considerably greater than previously available. **For easier maintenance:** permanently lubricated throughout, leakproof piping, conveniently grouped electrical controls.

You can get complete details at one of the Heald branch offices maintained for your convenience.

WRITE FOR BULLETIN
on the new Heald 261. Features, photographs, specifications.

ANOTHER OF
18 NEW
HEALD MACHINES

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

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FOR EXAMPLE

DONNELLY ELECTRIC & MFG. CO.

SIMPLIFIES DRILLING OPERATIONS

BY OVERHEAD MOUNTING

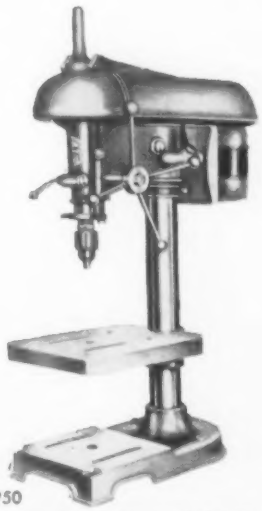
OF WALKER-TURNER 15" DRILL HEADS

How to drill and tap holes in bulky radar cabinets, some five feet high, without lifting them onto a drill press table was the problem faced by the Donnelly Electric & Mfg. Co., of Boston, Mass.

The adaptability of Walker-Turner Machine Tools made the solution simple. A battery of standard Walker-Turner 15" Drills was mounted from above and the cabinets, each requiring 44 holes of five different sizes, were placed on hand trucks and pushed along underneath them.

This is only one example where Walker-Turner Machine Tools are being used in groups and in special set-ups designed by the users to solve unusual problems, or free costlier machines for other work. Because they consider them excellent, rugged all-around machines, Donnelly also uses Walker-Turner Drill Presses for a wide variety of standard operations. Metals machined include cold rolled steel, hot rolled steel, aluminum, brass, and stainless steel.

Light-weight and compact, Walker-Turner Machine Tools offer extreme flexibility of mounting and control. Their wide range of speeds enables them to handle all types of materials from wood and plastics to tool steel. Rugged construction permits many operations, assures long, trouble-free life under the most rigorous production program. And low investment, low operating cost means real savings. *For complete catalog, write to Walker-Turner Company, Inc., Plainfield, New Jersey.*



Model D-950
Price: Less motor and belt guard **$69.50** *

Photo, lower right: 44 holes of varying size are drilled in metal radar cabinets with Walker-Turner 15" Bench Model Drill Presses. A cumbersome lifting job is eliminated by the overhead mounting.
**Photo, upper right:* 15" Drill Press, Bench Model D-950. 6 spline spindle, 4 ball bearings, 4¼" spindle travel, speeds with 1740 r.p.m. motor range from 600 to 5000 r.p.m. Capacity ½". Slo-speed motor optional.

walker-turner **MACHINE TOOLS**

DRILL PRESSES—HAND AND POWER FEED
RADIAL DRILLS • RADIAL SAWS
METAL-CUTTING BAND SAWS
POLISHING LATHES
FLEXIBLE SHAFT MACHINES
RADIAL CUT OFF MACHINES FOR METAL
MOTORS • BELT & DISC SURFACERS

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THREAD **SIZE CONTROL**

TO YOUR PRECISION REQUIREMENTS

– ON –

Steinle Centerless

THREAD GENERATORS

SMALL DIAMETERS
LARGE DIAMETERS
Just Change the Rolls

NO LONGER need PRODUCTION ENGINEERS worry regarding the accuracy specifications of threaded components.

DESIGN ENGINEERS may **now** specify closer tolerances than have previously been considered economical.

PROCESS ENGINEERS can now specify Steinle equipment for ROLLING all types of threads to Class 4 (or better) tolerances on a MASS PRODUCTION basis.

BY THE Steinle METHOD all parts are rolled repetitively to within a few tenths—to MIRROR FINISH.

THREAD ROLLING, by the Steinle method, gives you the following advantages:

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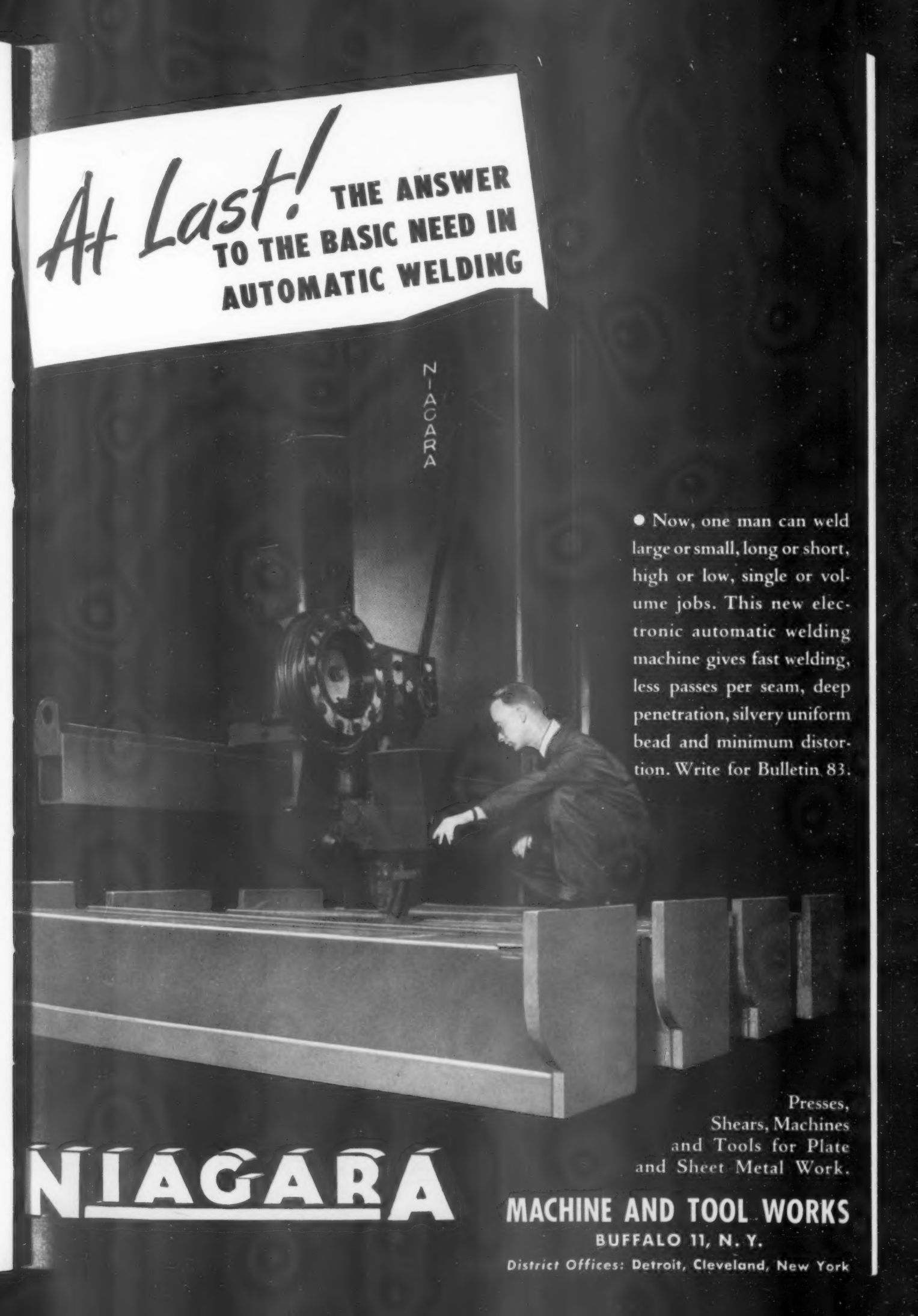
2. BURNISHED SURFACE—to 3 micro inches.
3. INCREASED STRENGTH—tensile resistance to fatique increased 20% to 50% by COLD-WORKING.
4. CLOSE-TO-SHOULDER WORK—within ½ pitch.
5. ROLL ALL METALS—from soft to pre-heat treated high tensile alloy.
6. WIDE RANGE—⅛" to 2¼" on one size machine—up to 4½" on larger machine.
7. FAST CHANGE-OVER—no cams or linkages—just change the ROLLS—½ hour or less.

Send us prints of your parts for estimates—or send us your parts for demonstration.

PERMANENT SHOW IN NEW BRITAIN

THE Steinle MACHINE COMPANY

NEW BRITAIN, CONNECTICUT


At Last! THE ANSWER TO THE BASIC NEED IN AUTOMATIC WELDING
NIAGARA
● Now, one man can weld large or small, long or short, high or low, single or volume jobs. This new electronic automatic welding machine gives fast welding, less passes per seam, deep penetration, silvery uniform bead and minimum distortion. Write for Bulletin 83.
Presses, Shears, Machines and Tools for Plate and Sheet Metal Work.
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MACHINE AND TOOL WORKS
BUFFALO 11, N. Y.
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NIAGARA

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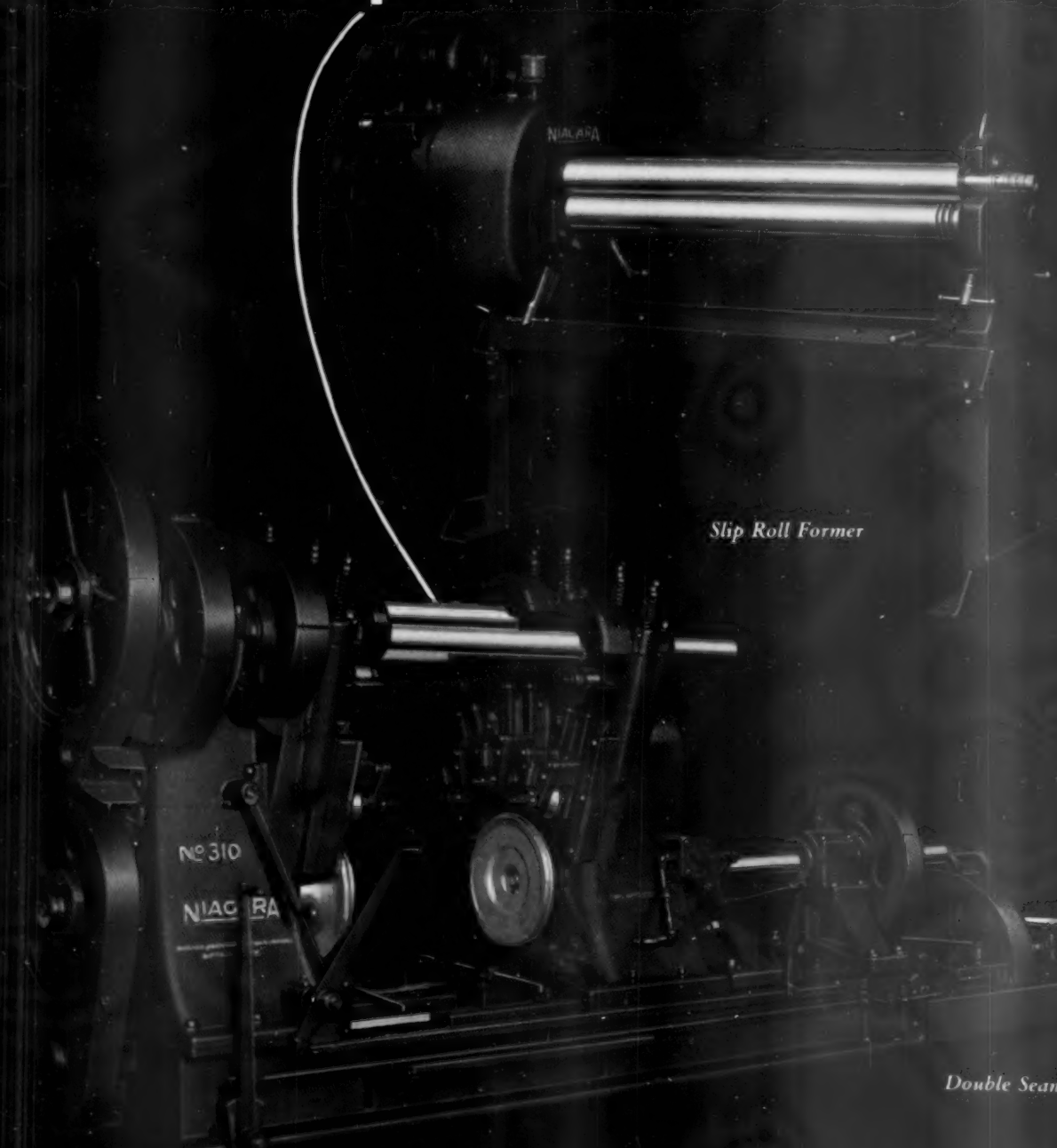
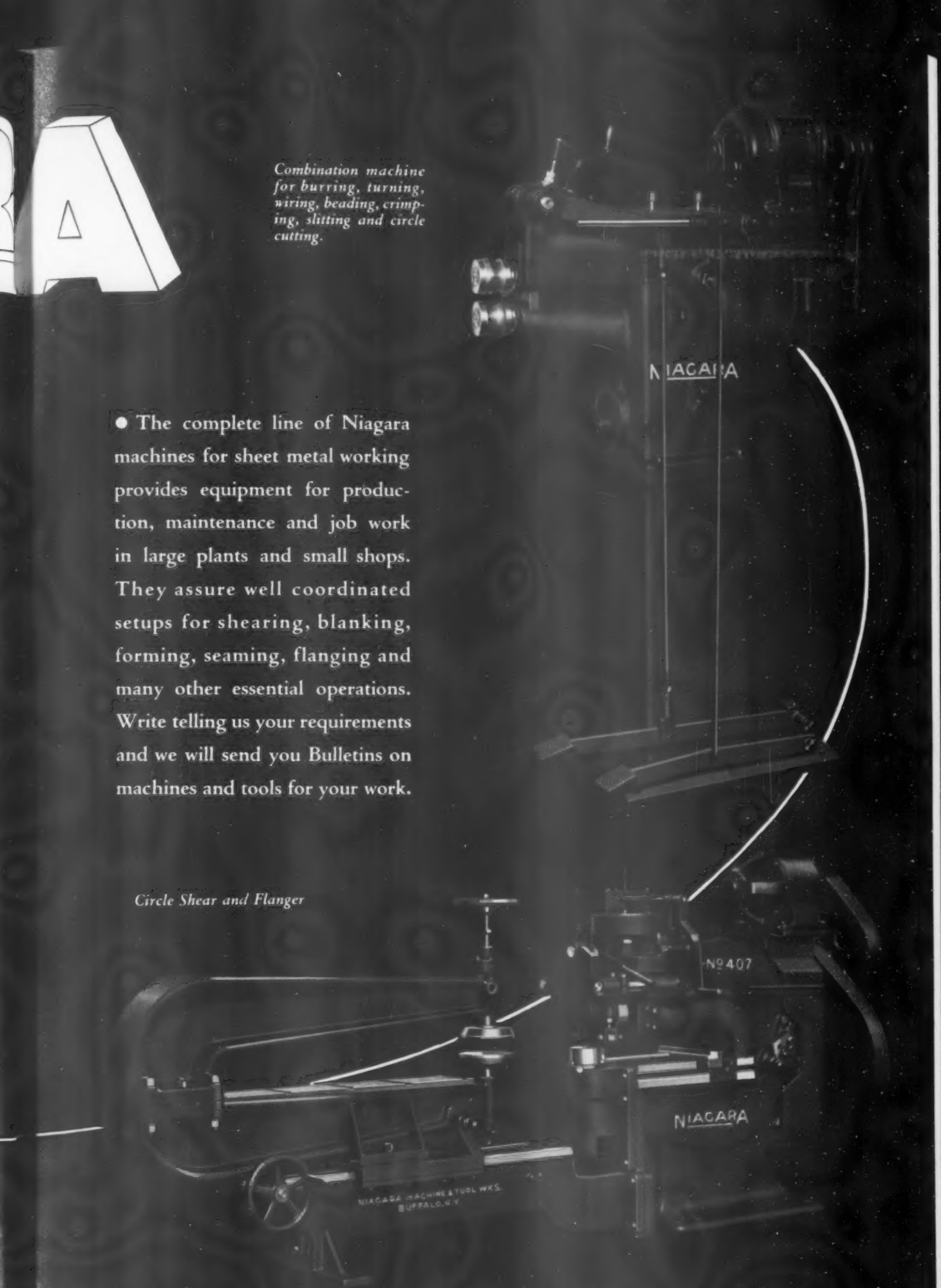
and tools for plate and sheet metal work



Slip Roll Former

Double Seamer

NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, NEW YORK



Combination machine for burring, turning, wiring, beading, crimping, slitting and circle cutting.

● The complete line of Niagara machines for sheet metal working provides equipment for production, maintenance and job work in large plants and small shops. They assure well coordinated setups for shearing, blanking, forming, seaming, flanging and many other essential operations. Write telling us your requirements and we will send you Bulletins on machines and tools for your work.

Circle Shear and Flanger

DISTRICT OFFICES — NEW YORK • CLEVELAND • DETROIT

Vulcan's Quality Creed

HIGH PRODUCT QUALITY

HIGH

YOUR CUSTOMER GOODWILL

YOUR SALES

YOUR PROFITS

AVERAGE

LOW

...for instance:

INCREASING THE QUALITY OF REFRIGERATOR SHELL THROUGH WELDING PRESSURE-TIGHT SEAMS

Product quality is a vital factor in customer good will—it also influences sales—influences profits. Equipment used to manufacture quality products must be made with quality if they are to produce quality. This is the Vulcan Creed.

In the case of the refrigerator shell, the manufacturer wanted to improve his product by welding a pressure tight seam where the rear panel joined the shell. A quality fixture was built by Vulcan which enabled the manufacturer to accomplish this improvement — without sacrificing production volume or increasing labor costs.

• • •

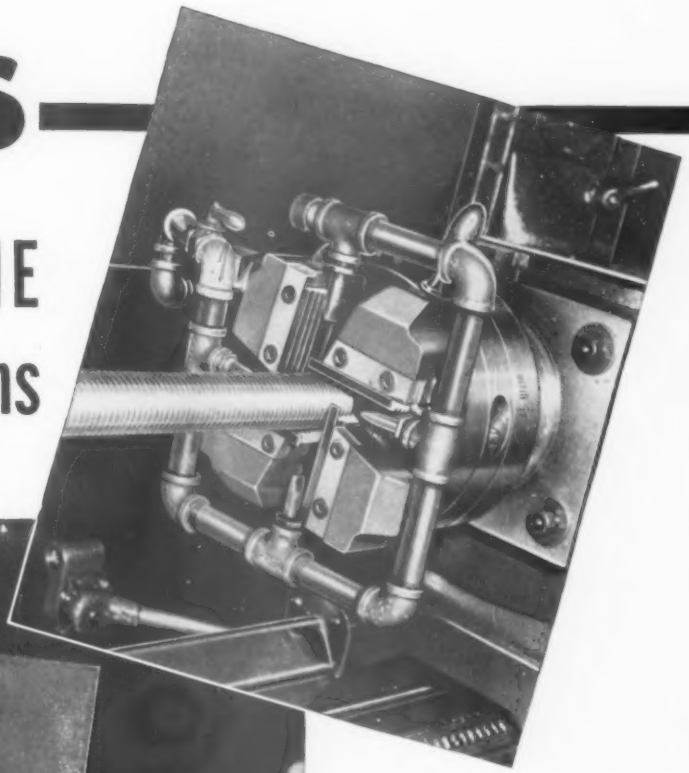
Vulcan Tool Co.

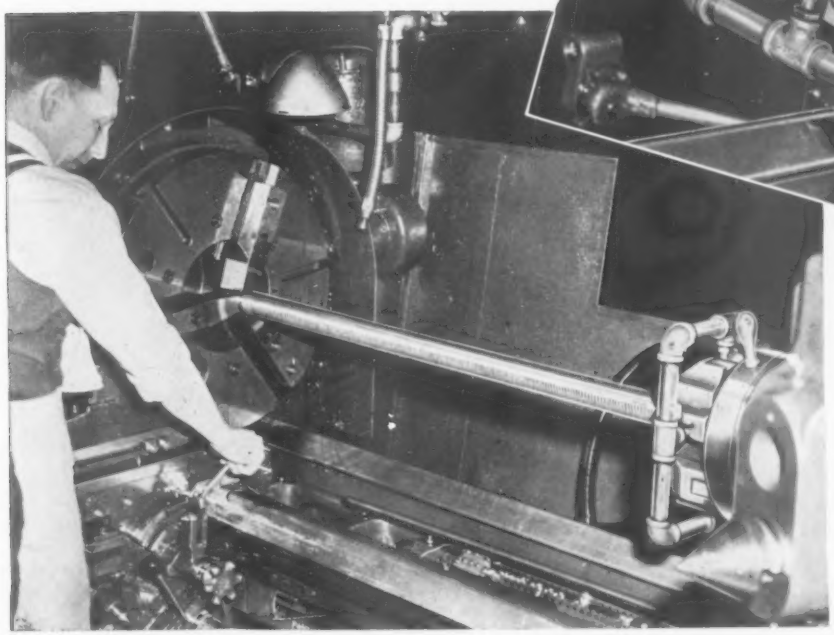
DAYTON 10 • OHIO • U.S.A.

The Vulcan Quality Creed gives you Tools, Dies, Fixtures and Special Machinery which will help you to increase Customer Good Will—your sales and your profits.

LANDMATIC Heads—

For TURRET LATHE Threading Operations





Illustrations show a 3" LANDMATIC Die Head used by a Western aircraft company to thread long Wing-Flap Retracting Screws to extremely close tolerances. An Acme thread of 2" diameter, 4 threads per inch, is being cut to a length of 45½" on heat treated alloy steel tube 48" in length.

Thread lead and pitch diameter are held within aircraft tolerances. Concentricity of thread with the O.D. of tubing and smooth finish is assured by the use of Landis tangential type centering throat and roughing and finishing form chasers. Centering throat section of the chasers takes a bearing on the O.D. of the tubing, eliminating an out of round condition that often exists when long work pieces are being threaded.

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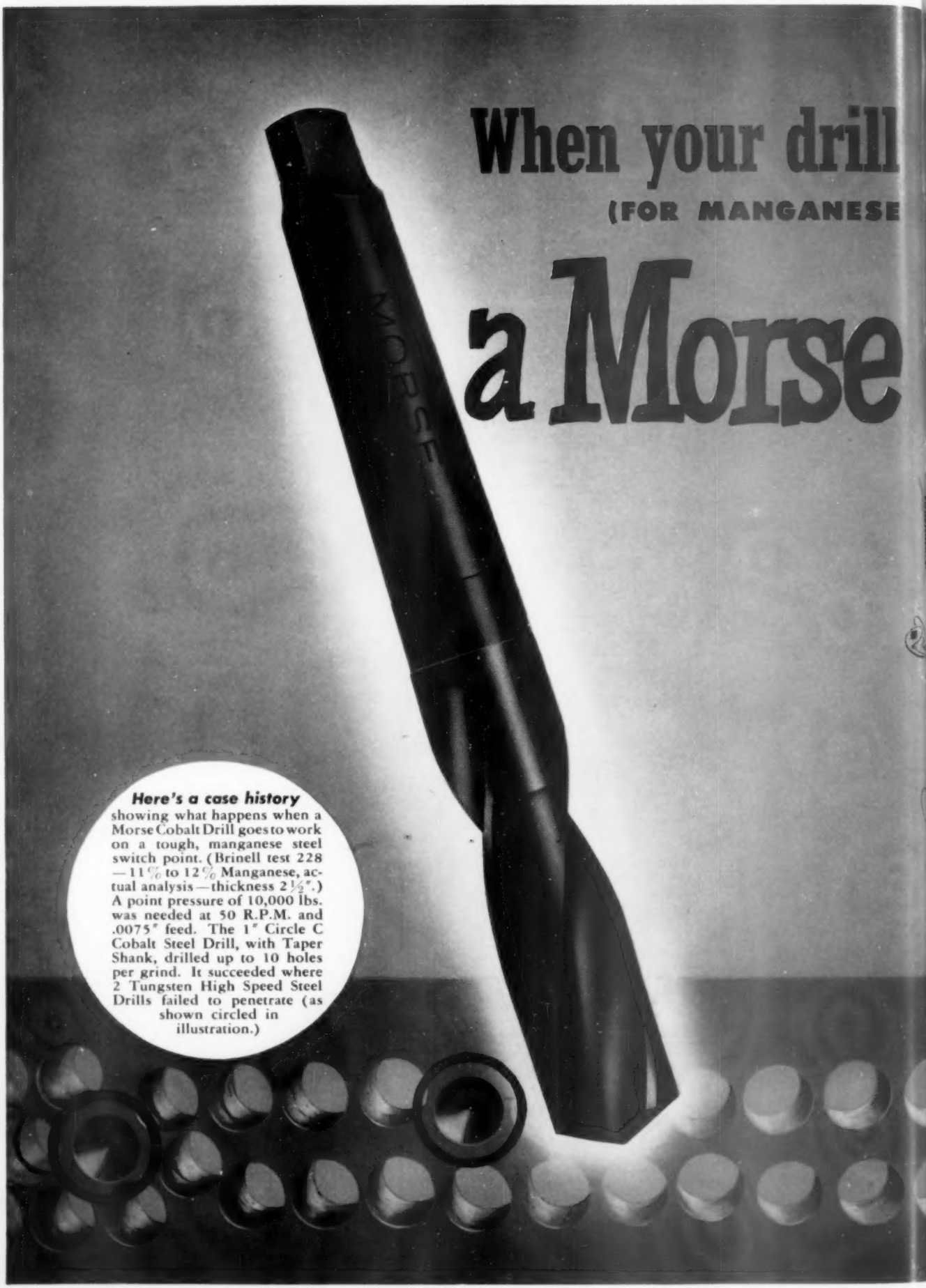
When your drill
(FOR MANGANESE
a Morse
MORSE
Here's a case history
showing what happens when a Morse Cobalt Drill goes to work on a tough, manganese steel switch point. (Brinell test 228 —11% to 12% Manganese, actual analysis—thickness 2½".) A point pressure of 10,000 lbs. was needed at 50 R.P.M. and .0075" feed. The 1" Circle C Cobalt Steel Drill, with Taper Shank, drilled up to 10 holes per grind. It succeeded where 2 Tungsten High Speed Steel Drills failed to penetrate (as shown circled in illustration.)

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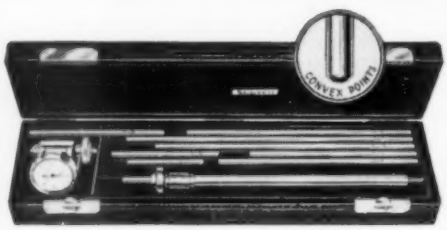

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Introduction to Plant Layout

For Maximum Performance, Tools must be Coordinated with the Flow of Materials

by A. E. Rylander

Installment No. 1 of a Series on Plant Layout and Materials Handling

A PROGRESSIVE DEVELOPMENT of machine tools, during the past several decades, and intensively accelerated during the late war, has culminated into what—for an interval at least—may be termed a practical peak. This does not mean that development is arrested—on the contrary, it is more intensive than ever—but that many developments, now in the laboratory stages, are so futuristic that several years may elapse before they can be applied to industrial uses.

For example, research in supersonics, electronics and other physical and electrical phenomena gives promise of completely revolutionizing metal processing—certainly, may cancel out present concepts of speeds and feeds. Nevertheless, they are "futures" as far as immediate use is concerned. Therefore, pending the time when these developments can be made generally applicable, we may look forward to a period of refinement, of existing tools, rather than to revolutionary changes. There will always be the exceptions.

To bear out this surmise, we need only to mentally review the recent Machine Tool Show, in Chicago, where visitors had opportunity to see the last word in current machine tool development. While some of the machines shown were refinements of previous models, many were radically new—so new that, in several instances, the builders had refrained from previous announcement lest, at the last minute, they could not have been made ready for exhibit.

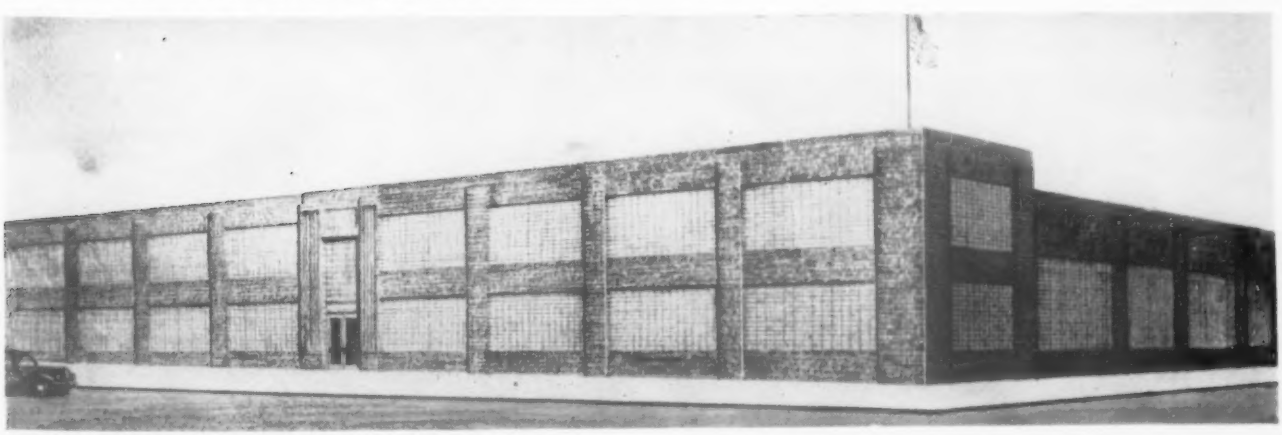
What the casual observer may have overlooked is that many of the new machines had required years for their development, years that, multiplied into man-hours, would run into a huge total. As for the collective exhibit, the total investment in engineering and design, patterns, special tools and equipment needed for manufacture, let alone advertising and sales promotion, would easily run into astronomical figures.

All things considered, then, it is not likely that the machine tool builders will be inclined to outmode these machines for some time to come. And even if they were so inclined, buyers of current models would doubtless think twice before replacing capital investment tools that, ordinarily, are amortized over a period of years. For a while, then, these standardized machine tools may be expected to "stay put".

Designed to handle carbide tooling, these ultra-modern machine tools are also rigid enough, in the main, to carry even greater loads. They are built to meet future demands. Special and automatic cycle machines, in turn, employ the latest of hydraulic, pneumatic, electrical and electronic controls to effect maximum operating economy and operator convenience. These too, may be considered adequate, not only for present requirements but, with possible modifications to suit seasonal product changes, for future demands as well.

To a considerable extent, this also holds true for late model gages and measuring instruments. For, except as closer measurements may be needed in the fields of pure science, optics and astronomy, the microinch may be considered the practical limit of measurement for interchangeable manufacture. In this field, development will be toward new and novel applications—as in broadening use of automatic gaging—rather than toward further subdivision of units of dimension that, in the final analysis, could not be practically applied to manufacture.

In the lexicon of the tool engineer, the plant is the master tool in the scheme of modern mass production. Typical of modern industrial plant buildings is this new research laboratory of the Heppenstall Company, Pittsburgh, Pa. Entirely windowless, all exterior and interior walls are of salt glaze ceramic buff tile; however, brilliant lighting is afforded by powerful fluorescent fixtures recessed into the walls. Radiant heating, with an air conditioning system augmented by air cleaning, provides adequate comfort with dust-free air to insure greater accuracy and control of testing apparatus.



There will, of course, be progressive refinement of cutting tools and a broader application of carbides, especially for dies and press tools. Outside of refinements in materials, however, and the exceptional revolutionary development, cutting tools in general may also be considered as "put" for the time being. Here, however, the investment is minor as compared to machine tools, and it is with the latter that we are mainly concerned in plant layout.

At any rate, these are the Tools of Today, many of them post-war developments but the majority proven "best by test" in the gruelling demands of wartime production. They are designed to cut costs, to balance rising labor costs with reduced unit costs the while they also reduce operator fatigue, both physical and mental.

Of particular significance is the fact that they are known quantities on which one may base production schedules that, in view of an unprecedented demand for consumer goods, may now tax manufacturing equipment to the limit of productive capacity. In view of this prospect, their use is a "must" in the scheme of modern mass production.

From a purely realistic viewpoint, then, it becomes apparent that industry must produce within the practical limits of even the most ultra-modern of available tools and appliances. That is, for the time being. Yet, no matter how highly refined or how completely automatic, machine tools alone (with, of course, their accessories) will not effect the economies necessitated by competition and existing industrial conditions.

For maximum performance, tools must be coordinated with all of the manifold elements, processes and functions of manufacture, and especially with the handling and flow of materials. It therefore follows, as a natural and logical corollary, that the attention of management should center more and more on a closer coordination of the tools used for manufacture. In other words, the trend is sharply and definitely toward improved plant layout and improved methods for materials handling.

A Definition of Terms

At this point, a definition of terms may be in order for a clearer understanding of the factors involved. In the lexicon of the tool engineer, any and all implements used for the processing of manufactured goods are designated as tools. This inclusive term embraces the plant which, with its buildings, equipment, men and materials, is deemed to be a tool in the same sense that jigs, fixtures, machines, cutting tools, conveyors and appliances are designated as tools.

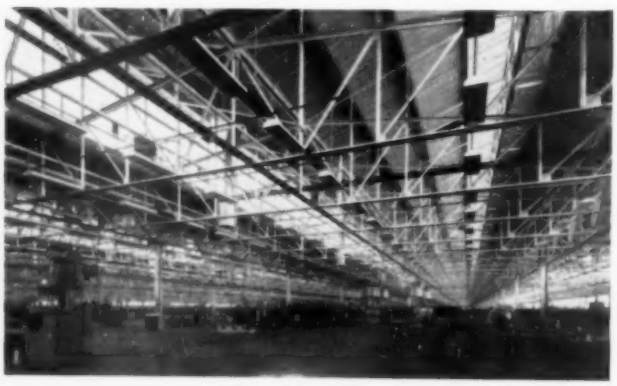
The latter may be considered as details of the master tool, which is the plant. And just as these accessory tools are subject to original design, and to possible if not necessarily probable redesign and reworking, so the plant as a whole is subject to original design and to expansion or modification as future contingencies may dictate.

Plant layout, then, must also be included in the general category of tools. It is a tool of management, and may be broadly defined as the disposition of men, materials and equipment, within and adjacent to plant buildings, for the economical processing of manufactured goods. Latterly termed *Plant Logistics* and reduced to a science, it embraces all processes of manufacture, from the receiving of raw materials to the shipping of the finished product, and coordinates them into a definite flow pattern.

A Close Integration

Essentially a part of tool engineering, which it supplements, plant layout is therefore closely integrated with all of the functions—methods, processing, production planning, welding, materials handling and inspection (quality control) that come under the broad jurisdiction of the tool engineer.

It is also closely integrated with plant safety and other engineering and production functions which may be somewhat outside the scope of tool engineering *per se* but which must nevertheless be coordinated with the whole. Particularly, it is closely integrated with plant engineering, and the



This group of photographs clearly illustrates the advantages to be gained from use of wide-span roof trusses in plant building construction. Note, especially, the clear expanse of floor space, providing practically ideal conditions for efficient plant layout. Photos by courtesy of Albert Kahn Associated Architects and Engineers, Inc., Detroit.

two functions are sometimes combined in one department and under one head.

So that there be no confusion regarding the respective functions, however, it should be understood that where plant layout deals with the *arrangement* of equipment, plant engineering is mainly concerned with its *installation*. Thus, a plant layout will show where machine tools and production machinery, presses, welders, furnaces, conveyors and other equipment are to be located for easy flow of material in process. From this layout, the plant engineer will prepare the necessary foundations, pits and trenches, in addition to other floor or overhead work, and attend to installation.

That other functions may also be defined and clarified, it should be understood that the methods engineer outlines what, in his opinion, is the best way to manufacture a part —that is, whether it shall be cast or welded, machined on standard or special equipment, or a combination of both. The process engineer, in turn, lays out the sequence of operations and designates the types of tools to be used—as jigs, fixtures and cutting tools—and the machines on which they are to be disposed.

Their findings, in turn, may be modified by the tool engineer who, however he may be titled in an organization—chief engineer, master mechanic and so on—is usually the final authority, under management, on all matters relating to tooling. In smaller organizations he may combine all of the engineering functions outlined above.

In any event, all phases of processing and manufacture are discussed by the parties concerned and when an agreement is reached, tool engineering will design or specify all of the necessary fixtures and cutting tools and will further requisition whatever capital investment equipment that may be needed to supplement existing equipment. From that point on, plant layout takes over, also under direction of or in close cooperation with tool engineering.

The "How" of Plant Layout

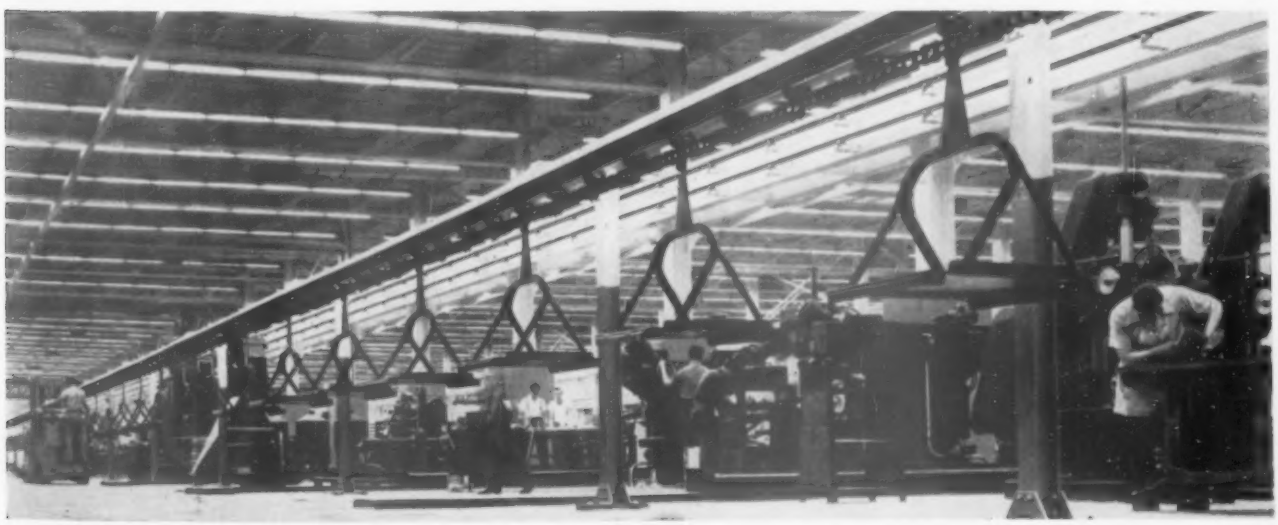
Having started the case and defined terms, together with an outline of essential functions, we will now proceed with the *modus operandi* of plant layout. Unfortunately, but due to its very nature, plant layout cannot be readily reduced to a standard. There are too many variables. Where, for instance, plant buildings and certain capital investment equipment—as, for example, boilers and large presses—presume a certain permanence pending final obsolescence, layout may be seasonally changed with the introduction of a new product or a new model. This is especially true in the automotive and allied industries.

Among other factors, diversity of products precludes standardization. For example, a layout might be admirably suited to the purposes of a small textile plant, but would not apply to the average small tool shop. And, while a layout ideally suited to the manufacture of insulated wire and cable might be adapted, in part, to the manufacture of steel wire and cable, or even to rope and cordage, it would be entirely unsuited to the manufacture of steel products. Standardized buildings might be similar, but plant layouts for diversified products would be entirely different.

Building Design Influences Layout

Another consideration in plant layout—and largely a deciding factor—is the structural differences in buildings, as whether they are single or multiple storied, or segregated into small bays with interfering building and craneway columns, or entirely clear from wall to wall or divided into wide bays as a result of long span steel truss roof construction. These differences in building construction have a deciding influence on the flow of materials.

It should be evident, then, that no hard and fast rules can be laid down for plant layout, and that no specific layout can be presented which would be generally applicable.



For maximum performance tools must be coordinated with the handling of materials, in which modern conveyor systems play an important role. Upper photo shows a conveyor with a system of "dips"; below, a floor supported track in which the I-beam is reinforced with a channel cap. Photos by courtesy of Albert Kahn Associated Architects & Engineers, Inc., Detroit.

What may be considered good practice, today, may later be rendered obsolete by the introduction of a new product, new or improved equipment, a revolutionary manufacturing technique or a new method for materials handling. The best that can be done, therefore, is to state the "musts" that will apply to a majority of conditions and to suggest the essential steps necessary for efficient layout.

Even here, one is constrained from outlining these steps in any orderly sequence. There are too many starting points, as though one were to approach an objective from any of the many points of the compass. For example, one might start out with (1) a new product, a new plant and entirely new equipment, as in the case of the huge Willow Run plant, specifically designed for aircraft production.

Or, (2) one might start out with a new product in an existing plant, as in the case of the late conversion to war production or, (3) with the view in mind of improving the layout for an old or possibly improved product in an old plant, as in the case of the later reconversion from war production to the manufacture of consumer goods.

A majority if not all of these variables will be discussed in the "case studies" to follow, each of which is designed to suggest practical applications. And, since three major elements—(1) the Product; (2) the Plant; and (3) Equipment—enter into all plant layouts, we will treat these in the order listed.

The Product

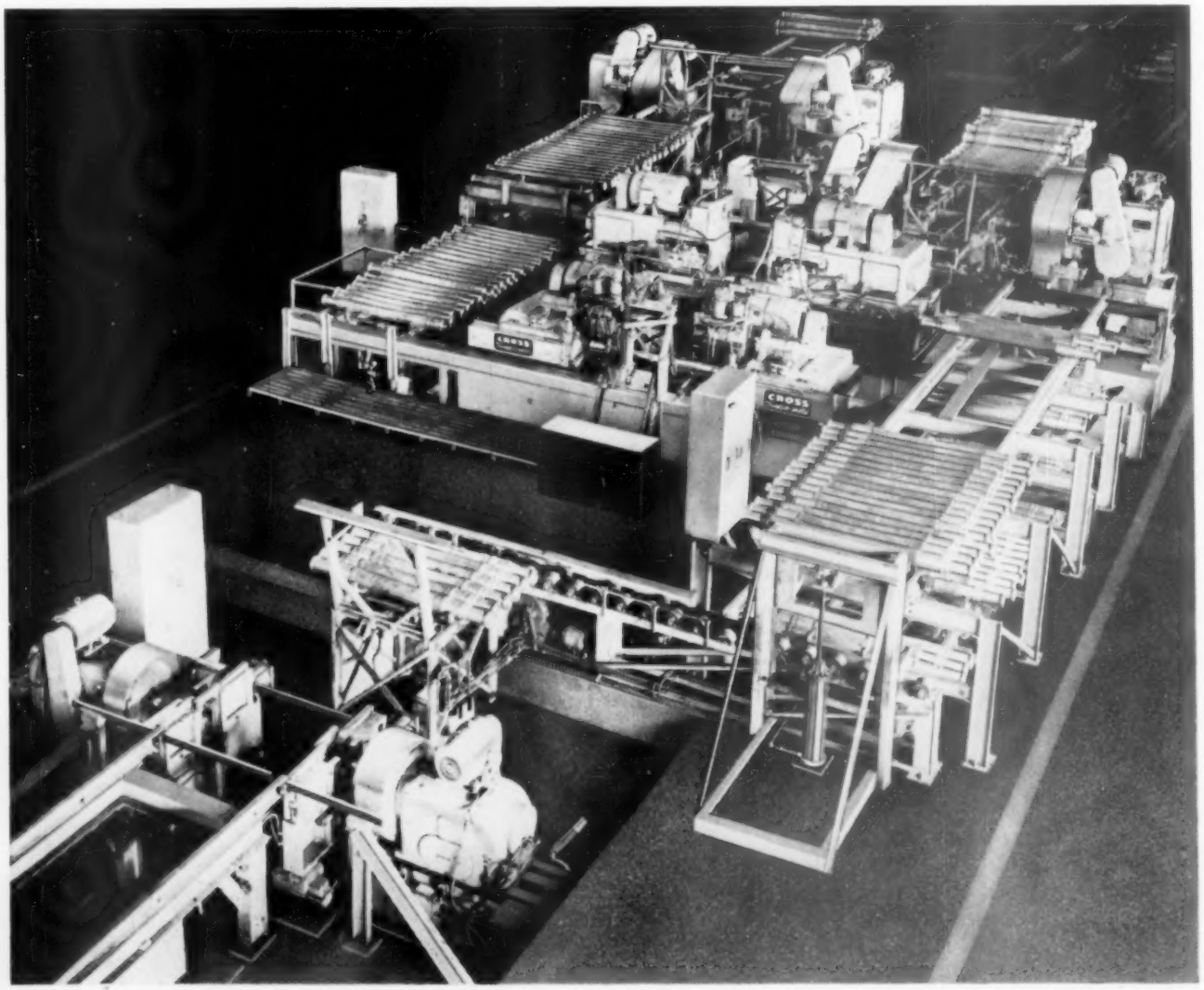
A product to be manufactured may be simple or compound. That is, manufacture may be confined to a comparatively simple element, as a toy of wood, sheet steel or plastics, or—as in textiles—to the braiding of shoe laces or narrow fabric. Or, it may be a highly complex assembly like the automobile which, in turn, comprises a number of sub-assemblies made up of numerous parts and accessories.

So that the reader who is unacquainted with the procedures for plant layout may have a better understanding of the factors involved, we will break down a typical passenger automobile into its main elements. These are:

The *Engine*, which embodies sand and die castings; forgings and steel stampings for the cylinder block; manifolds; piston rings; pistons; connecting rods and crankshaft, all machined or fabricated to precision standards and each requiring a separate plant layout. There will be screw machine products, gears and springs, as well as plastic products in addition to numerous accessories which, as a rule, are purchased from supplier companies but which require separate plants or departments for their manufacture.

The *Transmission*, which also embodies castings, forgings, bar stock, gears and screw products in addition to (as in some cases) hydraulic controls. Whether purchased or manufactured at the main plant, the transmission draws on many industries entailing many different plant layouts.

Typical of modern cost cutting equipment is this Transfer-Matic, by the Cross Company, Detroit. A system, rather than a machine per se since it involves a number of machine tools in combination with shutting mechanisms for moving the workpieces from one unit to another, the transfer type of machine is, to all practical purposes, a self-contained plant layout. While the machine shown is designed for the complete machining of railroad car axles, it can be adapted to a wide variety of work, with marked economies over single machines arranged in conventional plant layouts.



The *Front End*, once requiring an axle forging but now usually incorporated with the frame as a result of independent springing. However, it requires forgings for the steering knuckles and clevises; tubing for cross rods and drag links; castings and fabric for hubs, brake drums and brakes; ball or roller bearings; springs; rubber and screw products. Again, we draw on many industries entailing many plant layouts.

The *Rear End*, entailing (as in the majority of cases in modern practice) a pressed steel welded construction banjo housing, cover plate and gear cage, gears, axle shafts, bearings, hubs, drums and brakes and, with the splined drive shaft, one or several universal joints. The rear end may also be purchased from a specialist producer; in any event, many industries and many plant layouts are involved.

The *Wheels*, usually purchased from a special producer but nevertheless entailing comprehensive plant layouts.

The *Frame*, the manufacture of which is a huge industry in itself and which, in turn, draws on many other industries. A plant layout for frame manufacture will be shown later in this series.

The *Body*. Like the frame, this is also a specialty and draws heavily on contributing agencies, such as glass, leather (real or artificial) textile, rubber, body hardware and plastics among other industries. Many plant layouts are required for body manufacture.

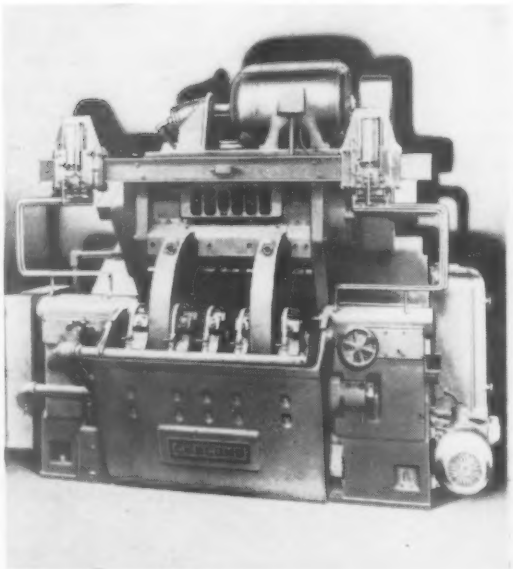
Tires, the manufacture of which is a specialty requiring the output of a huge industry, with major and minor plant layouts.

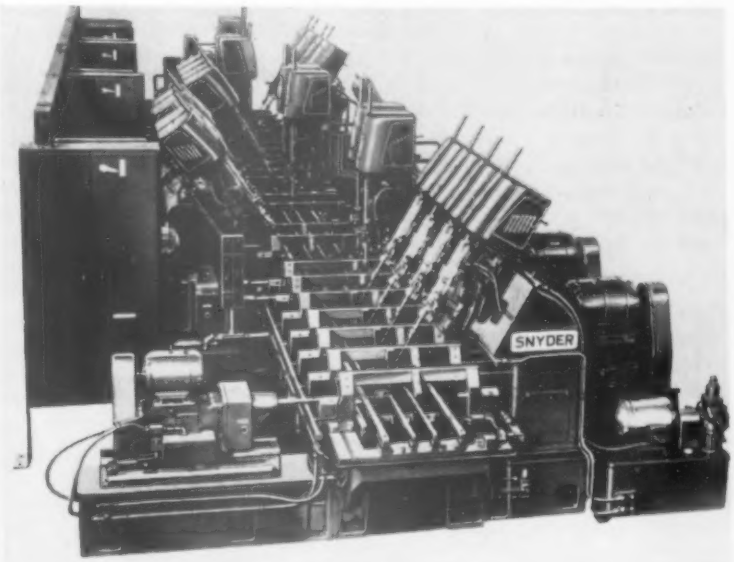
Lamps which, with the drawn shells, reflectors and bulbs, are the product of supplier concerns and therefore imply many separate plant layouts.

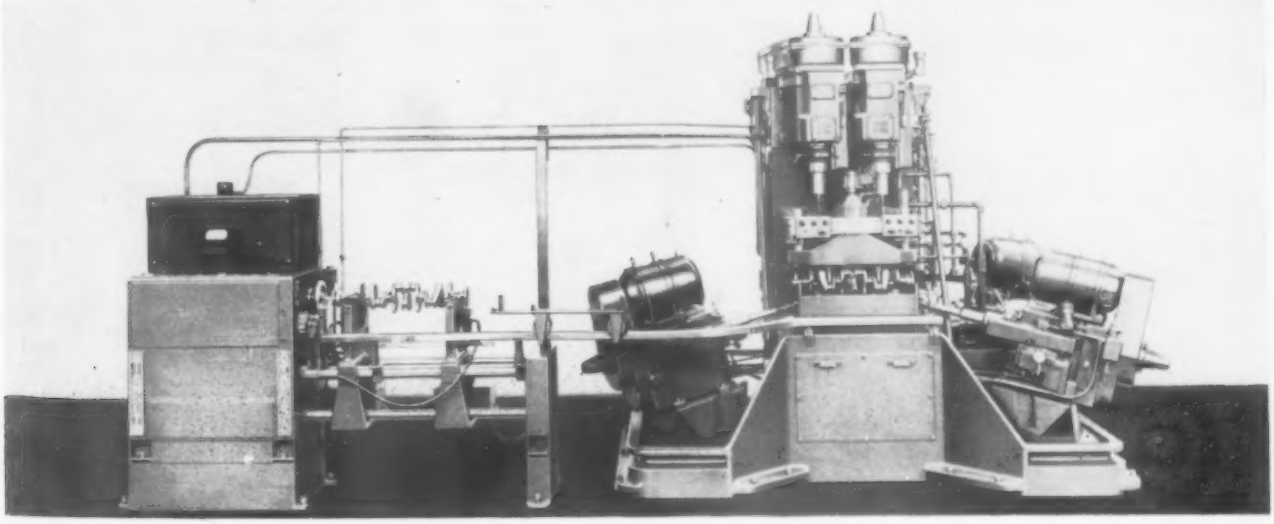
Accessories, such as starters and generators, distributors, carburetors, air and oil filters, instruments, electrical wire and cable, shims, gaskets, welsh plugs, lock and plain washers, cotter pins and so on through the gamut of details. These accessories, too, require plants for their manufacture and entail numerous plant layouts.

The foregoing, with its ramifications and subdivisions, covers but sketchily the manufacture of a compound product. To this may be added the countless number and endless variety of tools and appliances required for manufac-

Shown in photo at upper left is the 1LB Automatic Crankshaft Lathe, by the R. K. LeBlond Machine Tool Company, Cincinnati, Ohio. This machine, which is one of several special purpose crankshaft lathes built by LeBlond, combines rough and finish turning of line journals and has an output of 12 to 15 crankshafts per hour. At upper left is a special automatic drilling machine, designed and built by the Snyder Tool & Engineering Company, Detroit, for production drilling of oil holes in automotive crankshafts. Workpieces are loaded at one end and shuttled through 28 stations by an index bar. Since the Avey deep-hole drilling units are standard, this machine is typical of the flexibility of special tools that may be modified to suit seasonal changes in product design. The lower photo shows the Dymetric Out-Balance and Correction Machine by the Gisholt Machine Company, Madison, Wis., which automatically detects out-balance points and automatically removes stock to effect balance. These machines are typical of many outstanding examples of modern tool engineering.







ture. There will be required the output of many machine tool plants; of tool, die and gage shops; of steel mills and foundries; of rubber mills and textile plants and so on *ad infinitum* including the products of farm, forest, mine, oil well and—as in the case of magnesium—the very oceans as well.

While it may be within the stretch of imagination to encompass all of these elements into one composite plant layout, such treatment would be so involved as to render it confusing, and therefore valueless for the purpose of this discussion. The "plant" alone would require an area ordinarily allotted to a fair sized city, while the housing of the operating personnel would probably tax the capacity of its metropolitan area. In this introductory article, therefore, we will confine ourselves to simpler elements which, by comparison, may be easily handled and therefore more readily understood, especially by the uninitiated. We will discuss advanced layouts in part 2 of this series.

"Processing" a Product

Whether simple or compound, a product (or the components of a product) must be "processed"—i. e., broken down into operation sequences before layout for its manufacture can be undertaken. As an example, let us take a crankshaft for a 6 cylinder automotive engine and, without going into too involved detail, process it from receiving of material to shipping of the finished unit. Bypassing receiving, since this is initial handling rather than a processing operation *per se*, the flow of operations will be approximately as per the "operation sheet" shown below.

While it is usual practice, in layout operation sequence, to specify the machines which are used by name or number, depending on plant system, we have purposely refrained from doing so in the foregoing example. However, typical machines, for crankshaft manufacture as well as for other machining operations, are shown in the photographs used to illustrate this article.

For example, the Cross Transfer-Matic, which is here shown set up for the manufacture of railroad car axles, could be readily converted—and with marked economy—to a number of operations on crankshafts. The special purpose drilling machine, by Snyder, here shown tooled for drilling oil holes in crankshafts, can also be modified to suit other work, and to seasonal changes. The automatic crankshaft lathe is but one of several special purpose machines, for crankshaft turning, manufactured by LeBlond, while the Landis Tool Company, Waynesboro, Pa., manufactures grinding machines especially designed for grinding of crankshafts. Recent developments, by Gisholt, include a milling machine for simultaneously turning crankshafts and milling the cheeks, and the Dymetric outbalance and correction machine, for automatically balancing and correcting balance of crankshafts. Outstanding examples of modern machine tool engineering, these machines were centers of interest at the recent Machine Tool Show.

To use a pat expression, one can't logically criticize a blank sheet of paper nor, for that matter, a vague idea that may be variously interpreted. So, we draw lines and make the tentative start toward a layout. And few designs are so subject to

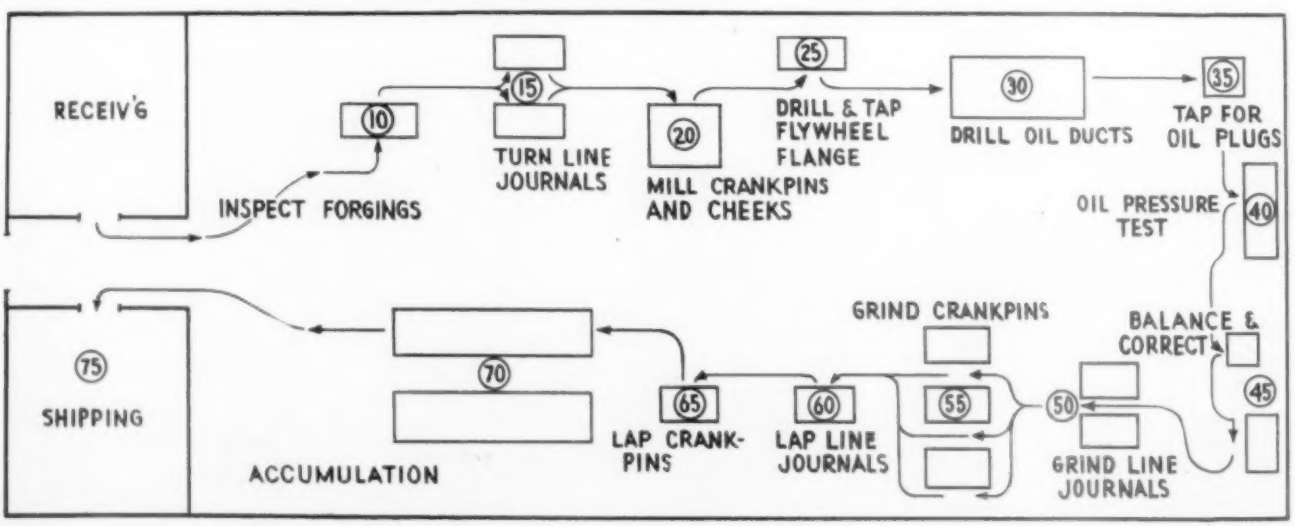
Typical Operation Sheet

Oper. 5*	Inspect forgings		Floor
Oper. 10	Center drill both ends	Vee fixture	2 spdl. opposed centering mach.
Oper. 15	Turn line journals and flange		Automatic crankshaft lathe
Oper. 20	Turn crank pins and mill checks		Special milling machine
Oper. 25	Drill & tap flywheel flange	2-station fixture	2-head horizontal multiple drill
Oper. 30	Drill oil ducts & c'drill for ⅛ pipe tap		Special automatic transfer drill
Oper. 35.	Tap for ⅛" pipe th'd	Free, in "cricket"	Tapping machine
Oper. 40	Test oil holes for pressure		Hydraulic tester
Oper. 45	Balance		Automatic balancing machine
Oper. 50	Grind Line journals		Crankshaft grinder
Oper. 55	Crind crank pins		Crankpin grinder
Oper. 60	Lap or superfinish Line journals		Special lapping machine
Oper. 65	Lap or superfinish crank pins		Special lapping machine
Oper. 75	Inspect**		
Oper. 70	Wash	Conveyor	Wash booth
Oper. X	Transfer to assembly or shipping		

*For the benefit of students and others who may be unversed in the procedures for plant layout, and who may wonder why the operation sequences are numbered in multiples of 5 rather than in 1, 2, 3 order, this is done so that, if later operations should be added, they can be inset without changing the original sequence numbers. As stated in the text, the sequences shown are approximations and would vary somewhat from plant to plant or to suit specialized equipment.

**Sample inspection, station to station, as work progresses, is assumed.

Fig. 1. Schematic flow diagram for manufacture of automatic crankshafts.



criticism and repeated revision as plant layouts. If, however, the operation sequences of the various components of a job are known and set down in an order which seems to be workable, we then have a tangible foundation on which to base a start.

The operation sequences established, they are passed on to Plant Layout, which then proceeds to outline a plan for production. As previously stated, however, the line of flow will depend largely on the character of the buildings; therefore, it is a good idea to lay out a tentative flow chart before proceeding with the plant layout itself. In this connection, the diagram shown in Fig. 1—which, incidentally, can be infinitely varied to suit divers applications—will serve as illustration for the crankshaft discussed above. As outlined, it is intended to show one way of starting a plant layout rather than how to manufacture a crankshaft.

All things considered, however, it will become evident that one of the requisites of a plant engineer is a broad familiarity with the properties of materials and their behaviour under actual manufacturing conditions. Another, and a very important requisite, is a broad knowledge of machine tools and manufacturing equipment as a whole. Of this, more later on; at this point, we will briefly discuss the plant—that is—the buildings and adjacent yards.

The Plant

As previously stated, one can start out from scratch—e. g., with a new product and no buildings, but with the acreage on which to dispose them. The term acreage is used advisedly since, under present conditions, it is desirable to provide adequate yard space, for parking, in addition to room for future expansion. In modern practice, buildings are designed to suit the product and should be planned along ultra-modern lines.

Or, one works with existing buildings, in which case one is subject to their limitations. In either event, one of the essential requisites, in plant layout, is a complete floor plan of all buildings, whether in fact or in project. This should include the exact location of all building and craneway columns, widths and lengths of bays; windows and exits, and the location of all permanently located equipment, such as boilers, large presses, transformers and air compressors.

Preferably on separate drawings, although they may be included in the above, there should be layouts of floor and overhead conduits and bus bars, steam, air, gas, hot and cold water pipes, fire hydrants, sewer lines and manholes. All pipes should be marked according to the standard color code of the gases or liquids for which they are vehicles.

Supplementing these drawings should be cross sections showing heights of roof lines and truss chords, heights of crane rails (an essential when determining clearances) and depth of sewers below surface in addition to trenches or other underground work. Preferably, all of these drawings should be made to an identical scale. In addition, there should be a plot plan, showing outside dimensions of buildings, extreme property lines and adjacent streets and alleys, with orientation. Also, the plan should show location of spur tracks, if any.

Typical layouts, covering these considerations, will be shown further on in this series; for now, however, we will select a few simpler layouts, as, for example, the plan for a small textile plant, for manufacture of narrow fabrics—i. e., shoestrings, corset laces, ribbon or narrow braid—shown in Fig. 2.

In its present small state, this plant has a common receiving-shipping entrance, sealed off by doors at both ends to prevent outside air from affecting the inside heat and the humidity necessary for textile manufacture. The raw material—cotton or rayon yarn in this case—is first brought to cotton storage, and moves from there, as needed, to the Universal winders. The area marked "future" may be currently used for accumulation.

From the winders, the yarn moves to the braiders, shown in 7 banks, and from there to spooling or carding, thence to inspection and from there to finished storage, where it moves to wrapping and shipping. It will be noticed that spooling, carding and inspection are at the front, toward the offices, this being in close proximity to the supervisory personnel. At any rate, material flows smoothly from Receiving to Shipping, without any untoward interference. Braider repair is at the rear and easily accessible.

For future expansion, it is only necessary to move back the rear wall, when the layout will remain practically as is, except that the braider banks can be extended. Since the material is light, in this case, it may be easily moved by hand trucks. Racks, both empty and loaded, are also comparatively light and are rolled into and from position in the braiders which, in turn, are light enough to be easily dismounted from the benches in case of repair.

Everything here is on the one floor, with the exception of heating and air conditioning equipment, which is located in a part basement. Storage rooms are left dark, but all working area is adequtely lighted from the side windows and lights in the roof, which is saw tooth. For that matter, the entire plant could be windowless in line with a growing trend.

Layout for Tool Room

Plant layout for a tool room will depend largely on the nature of the product. For example, the layout for a die shop would differ somewhat from that of a tool room devoted to jig and fixture work; yet, both will have certain things

Fig. 2. Plant layout for a small textile plant engaged in the manufacture of narrow fabric or shoe laces. From a common receiving-shipping entrance, yarn moves to cotton storage, from storage to the winders, from winders to the braiders (shown on four banks), from braiders to spooling or carding, thence to inspection, finished storage, wrapping and shipping. Future expansion would be from the rear of the building.

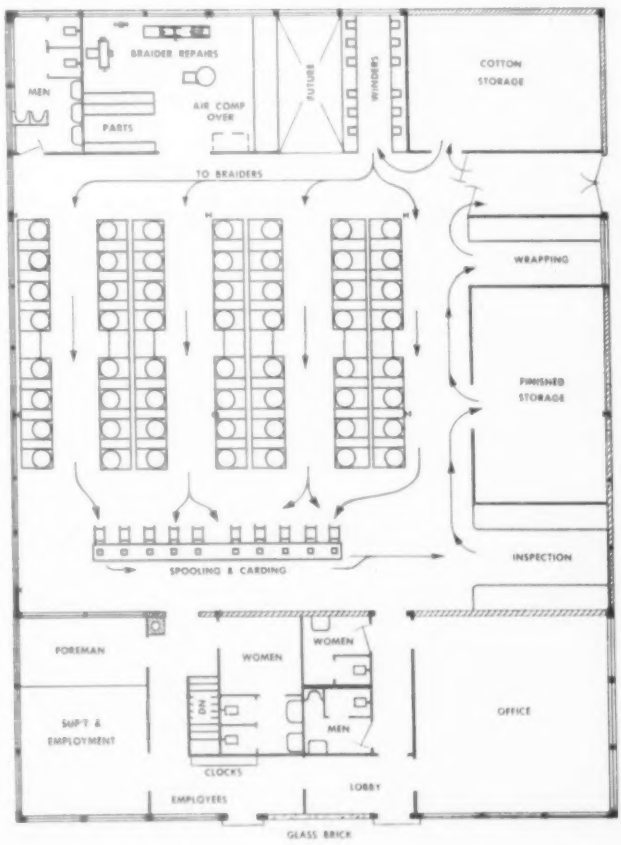
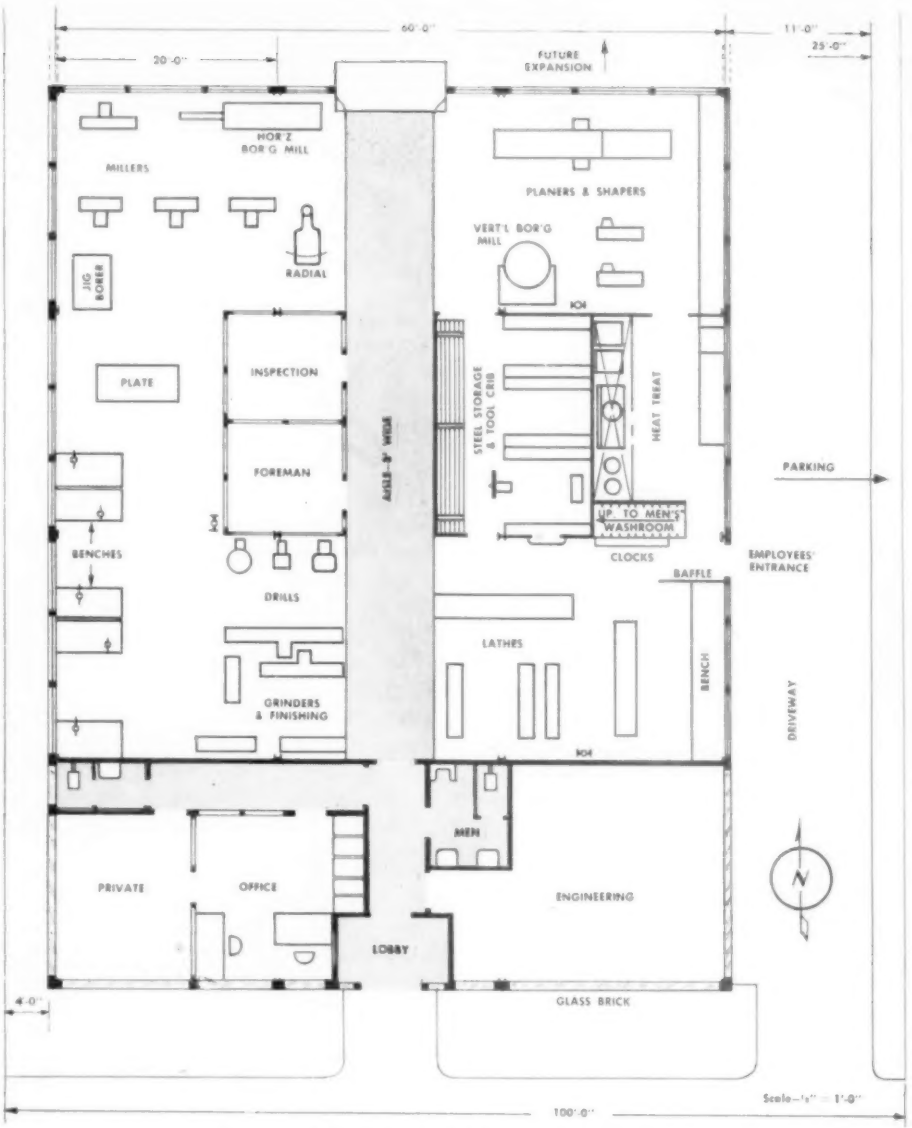


Fig. 3. Plant layout for small tool shop.



in common. For instance, consideration must be given to flow of material and to facilities for its handling, and to disposition of machine tools and work benches; in addition, sufficient space must be alloted to assembling and erecting, as well as to comfort facilities. An important consideration is the location of tool cribs, stock rooms, and general, engineering and supervisory personnel offices in relation to the whole.

One thing to consider is that toolmakers are skilled craftsmen as compared to the general run of production workers, and that, as a general rule, each job is a problem in itself to be studied, machined, fitted, assembled and tried out. Often, there is entailed considerable experimental work in which the individual tool or die maker may work in close cooperation with supervision or engineering.

For that reason, engineering should be easily accessible to the shop, while the offices of the general superintendent or foreman should be of sufficient size to hold groups engaged in consultation. There should be tables for spreading out blueprints and, preferably, at least one drawing board. True, the tool room is not the engineering department, but the drawing board comes in very handy when checking dubious layouts. Preferably, to provide a broader view, the offices of supervisory personnel should be raised one or two steps above the main floor level.

While the foregoing deals mainly with generalities, we have a specific example in Fig. 3, a small tool shop which, like the small textile plant, is also laid out for future rearward expansion. As shown, the building is divided into three 20'-0" bays, which provides span for a comparatively light overhead crane, should one be required. The combined tool crib and steel storage is centrally located, with the men's washroom, overhead, accessible by a stairway. The heat treating room is also centrally located and closed off from the rest of the plant.

A center aisle provides for movement of stock or work in process by truck, and the foreman's office, and inspection, front on this aisle. Turning and grinding is toward the front, with the heavier machine tools toward the rear; thus, heavy castings can be dropped in close proximity to the planers, shapers and boring mills.

It will be noted that the benches, for the toolmakers, are at right angles to the window line, two individual benches facing each other. Benches so disposed have the advantage that a worker does not face the light, which has a tendency to contract the pupils and thus impair vision—an important consideration when engaged on close work. Benches so placed also provide a greater sense of security, inasmuch as the worker is guarded from passing traffic; furthermore, this system actually provides more bench room than if the benches were situated along the wall. However, no such consideration need be given the benches adjacent to the machine tools, which are mainly used for temporary accumulation of work.

"Good Housekeeping" marks this modern toolroom at the Gleason Works, Rochester, N. Y. Machine tools—jig borers, millers and lathes are disposed in "departments" with intervening aisles. Adequate lighting facilitates the precision workmanship necessary for tooling a precision product.

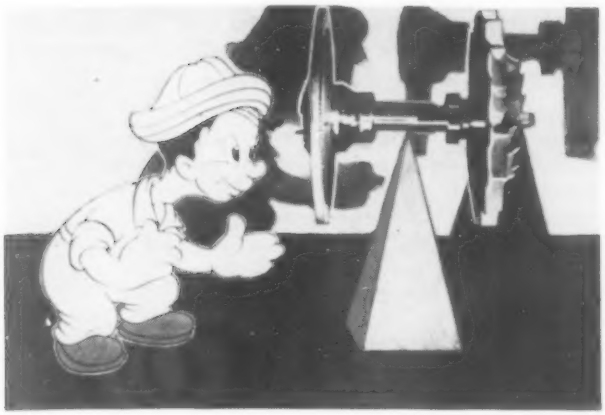
End of Part 1, this Series. Part 2, in which advanced layout will be discussed, will follow in February The Tool Engineer.

by **H. L. Seekins**

34-63000

Balancing Supercharger Rotors

An improved method of high-speed balancing promises sustained safe functioning of aircraft power plants



THE VERY HIGH operating speeds of turbosuperchargers—from 20,000 to 26,000 revolutions per minute—requires balancing of the rotating parts to a degree usually associated with gyroscopes. Dynamic balancing is very important because the force developed by an unbalance increases in proportion to the square of the speed.

In a rotor running at 24,000 rpm (or 400 revolutions per second), a force due to an unbalance is 576 times that at 1000 rpm. An unbalance of one-tenth gram (the weight of two unlicked three-cent stamps) at a five-inch radius on a supercharger rotor operating at 24,000 rpm, has a force of over 8,000 grams, or eighteen pounds. This force is over 80,000 times the weight of the original unbalance, yet it would displace a 50-lb. rotor only 22-millionths of an inch from its geometric axis.

Balancing Requirements

At first glance, one may ask why a supercharger rotor must be balanced to a tolerance equivalent to a few millionths of an inch displacement. This very small displacement is negligible by itself, but since the rotor is a part of an assembly, the rotor vibration may cause some other part to resonate at its natural frequency. A few millionths of an inch vibration of the rotor may build up in some part to several mills vibration, which can cause fatigue failure, wear, or creep in the part.

All turbosuperchargers are very precisely analyzed and designed for the absolute minimum of weight. This type of design reduces all the various metal sections around the rotor to thin-walled light alloy castings, sheet metal, slender studs, tubing, and other light-weight components.

Each one of the component parts of the complete assembly may have many critical vibration frequencies, and many modes of vibration between zero and 24,000 rpm. All of these light components, together, have comparatively little weight and rigidity, as compared with all nonaircraft apparatus, to absorb and dampen any vibration which may develop.

The normal deviations in sections, due to casting and stock variations and machining tolerances, will cause enough variation in the natural vibrating frequencies of component parts and assemblies, so that the possibility of eliminating all undesirable characteristics of vibration becomes nearly impossible by calculation. The balancing refinements on turbosuperchargers reduce the unbalance to a point where it cannot excite any component to an undesirable or hazardous amplitude of vibration.

The continued safe functioning of all aircraft power plants requires periodic overhauling. The normal variations of positions and fits of all parts at each assembly, although very small, introduce varying factors on both the natural vibration periods and damping characteristics of all turbosupercharger parts. Every rotor must be disassembled after final balancing in order to assemble it in the remainder of the unit. The balancing tolerances must consider the possible unbalance variation which may be produced by this disassembly and reassembly after the balancing operation. Mass displacements of a few millionths of an inch must be evaluated when considering these factors.

Harold L. Seekins **is Planning Engineer in the Aircraft Gas Turbine Mfg. Division of General Electric Company, Lynn River Works. He is a recipient of the Charles A. Coffin Award, the highest honor conferred by General Electric on its employees, in recognition of his outstanding contribution, during World War II, to the art of manufacturing superchargers by a superior balancing process. He is a member of Boston Chapter, A.S.T.E.**

Normal wear and changes during operation introduce another source of variation. Long experience has proved that, while less refinement in balancing may be satisfactory for limited operation on a test stand, it cannot be expected to prove satisfactory for actual service operation. In general, the vibration due to unbalance tends to cause a rise in vibration amplitude at a steadily increasing rate. It is necessary that sufficient refinement in balancing technique and tolerances be maintained to avoid this condition.

Due to the high operating speed of the rotor, this vibration is repeated nearly one and a half million times every hour of operation. Excessive vibration is a grave hazard because it could break the supercharger loose from its mountings on the plane. Another reason for this fine balance is because the supercharger may be part of a combat unit, and as such is subject to damage by enemy fire. The balancing tolerance provides a margin of safety for an unbalance which might be caused by combat damage. It is evident from these figures why extreme care is necessary, and why very sensitive balancing machines are required.

A turbosupercharger rotor consists of a bucket wheel, a shaft, six so-called "rotating parts" which include oil deflectors, bearings and spacers, which are fitted to the shaft, and the impeller. A typical assembly is shown in Fig. 1. The complete assembly is held together by a nut on the impeller

and of the shaft. There are fourteen or more parallel mating surfaces which are matched together along the shaft. All these parts have a tolerance of 0.0002" maximum runout with the bore, and not over 0.0002" out of parallel of the two faces. They are ground and lapped well within these limits. Several are held to 0.00005".

It may seem strange that such extreme care must be taken with these parts, but it is necessary to obtain the required balance on the final rotor assembly. The final assembly must be balanced within an equivalent displacement of approximately 50 millionths of an inch. Because of the accumulated runout of the parts fitted to the shaft, it will be bent when the nut is tightened. This bending of the shaft will deflect the wheel and impeller from the normal position and cause an equivalent unbalance, as exaggerated and shown on Fig. 2 for the wheel end only.

Every final rotor assembly is first balanced "loose" with balancing clay, after which the nut is tightened to the prescribed torque. One or more of the rotating parts are rotated, after loosening the rotor, until the "tight" condition unbalance is also within the tolerance. By rotating a part, its runout may cancel that of an adjacent part. This operation is called "loose and tight balance." All unkeyed parts are zeroed with an electric etcher to insure correct alignment during future assembling.

History

To bring this article up to the present, a brief review of how balancing machines have grown into long pants seems in order. Before World War II, the demand for better balancing was increased by high-production standardized manufacture of engines, electric motors, high-speed home appliances, and other rotating machines. In the process of improving designs manufacturers reduced the size, weight and noise of these items, and higher speeds were developed requiring better dynamic balance. The rigid weight requirements of all air-craft accessories required during World War II again reduced the size and increased the speed of rotating equipment.

The electronic engineers had the tools with which to tackle all three functions. For the precision balancing of small work it is necessary to measure vibration of a few ten-millionths of an inch. They had just the tool for this—amplification. In order to keep out all other vibration, except that produced by unbalance, they had to design selective filters. The first function—isolation of each balancing plane—can be done very easily by a mechanical or an electrical network. In order to locate the position of unbalance, the machine must be fast, and electrons cannot be beat when something must be done in a hurry. To locate the position of an unbalance within one degree at a radius of 12 inches on a piece rotating 1200 rpm requires timing within one ten-thousandth of a second.

About 1935, several machines by various manufacturers appeared on the market which were developed in their laboratories. These machines have now progressed to reliable production line machine tools. Balancing machines are now being built which use more than 50 electron tubes, including cathode-ray tubes, photo-tubes, thyratrons, and many others. The sensitivity of these machines has been increased until, for small work, ¼ micro-inch vibration due to unbalance can be measured and located. For larger work, up to 1000 pounds, 5-millionths of an inch; and for work up to 50 tons, 25-millionths of an inch can be measured.

The balancing requirements on superchargers have been responsible for (a) the further development of very sensitive and accurate balancing machines; (b) various improvements in manufacturing methods to minimize the original unbalance; and (c) very large savings in the man-hours required for balancing operations.

Previous Balancing Methods

The original General Electric turbosupercharger, as developed by Dr. Sanford A. Moss, was dynamically balanced on what is commonly called an "air frame," as illustrated by Fig. 3. It consists of a frame work, or "cradle", supported on one end by a compression spring, and on the other end by two pivot bearings. The work is driven in its own bearings by an air jet. It is accelerated to a speed slightly above the natural vibrating frequency of the mechanical system and allowed to coast down. The low-inertia dial indicator registers the peak vibration of the cradle, as the work coasts down through the "critical". A piece of balancing clay is applied to any point on the rim of the wheel, the process is repeated, and the clay is varied and moved until the indicator reading is within the specified limit. The pivots and springs are then changed to opposite ends respectively, and the process is repeated on the other end.

Material is ground from the wheel rim by holding an air grinder with one hand and oscillating the rotor approximately 120 degrees with the other hand, as shown by Fig. 4. Both the balancing with the clay, and the removal of stock by this method, are by cut and try. And while this type of balancing machine is very sensitive and reliable, its operation requires considerable experience and skill, which limits it to small quantities and development work. Therefore, it is not very suitable for high production.

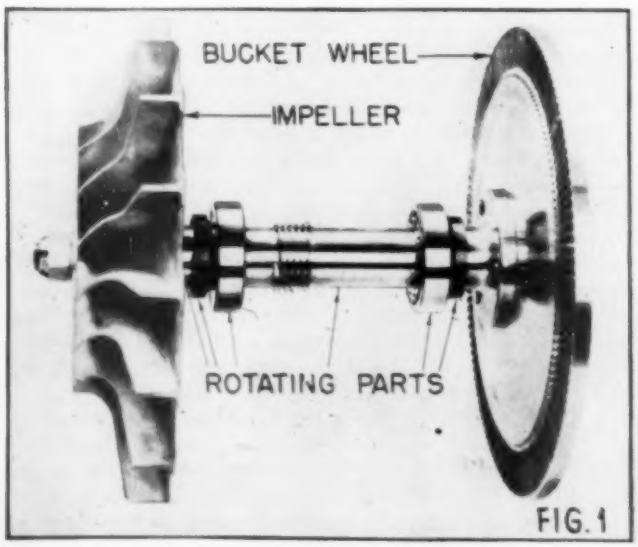


FIG. 1

FIG. 1. Type "B" Turbine Supercharger Rotor assembled and ready for balancing.

FIG. 2, showing exaggerated condition of one rotating part out of parallel in rotor.

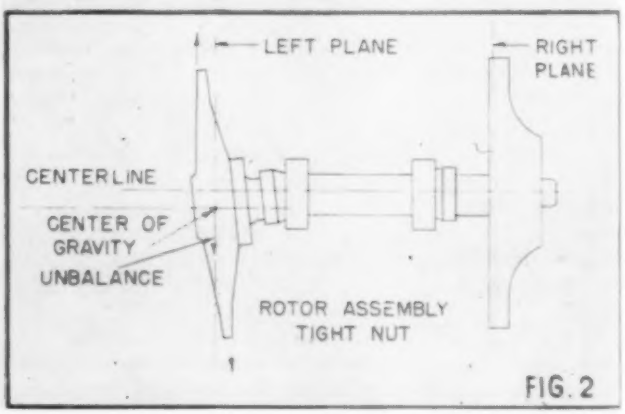


FIG. 2

Present Balancing Method

At the beginning of the war it was apparent that the air frame type of machine would not fulfill the production requirements of the turbosupercharger. Each turbosupercharger required, by air frame balancing, from 4 to 6 hours balancing time. An electrically-operated dynamic balancing machine was then tried out on balancing a small rotor, and the results justified purchasing two machines to develop the method. Due, however, to the extremely fine balance required, and problems of driving the rotors with a belt instead of air, several months' development were required and so many changes were made that the machines are now designated by the manufacturer as "special rotor balancers."

Each new rotor design required a new balancing technique and presented new problems. The engineers of the balancing machine division of the manufacturer worked very closely with General Electric engineers during this early development period, and eventually enough experience was accumulated to predetermine the requirements on new work. Fig. 5 shows this machine with a turbosupercharger rotor in position, ready to "run and read" the amount and position of unbalance.

These machines are set up for each type of rotor by means of a "master rotor", which is an exact duplicate of the production rotor, and calibrating weight screws. ¼"-28 holes are jib-bored, spot-faced, and tapped at exact radii in both the wheel and impeller ends. The rotor is then dynamically balanced and maintained as closely to zero unbalance as possible.

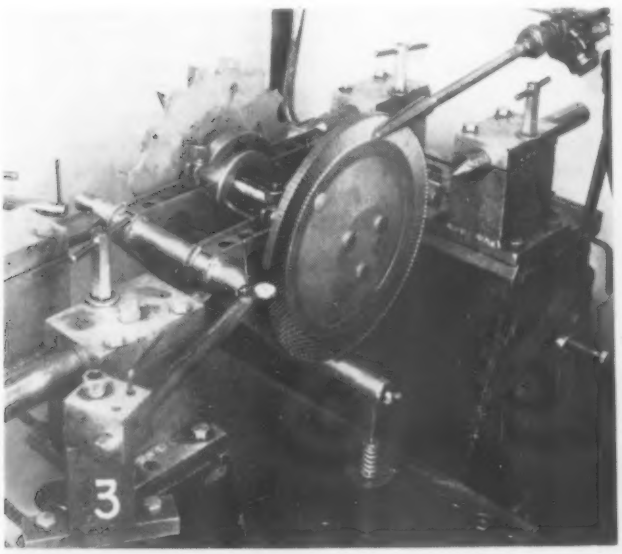
Weight screws are made to micrometer dimensions, and calibrated to 0.01 gram accuracy. These are maintained in sets, by which combinations of unbalance from 0.05 gram to 15. grams may be applied to the master rotors. Every balancing machine in production is checked every shift with the master rotor, and the set-up recorded on a form and approved by the balance inspector. This insures that all balancing tolerances are maintained and that the machine has the best set-up for maximum efficiency and accurate calibration.

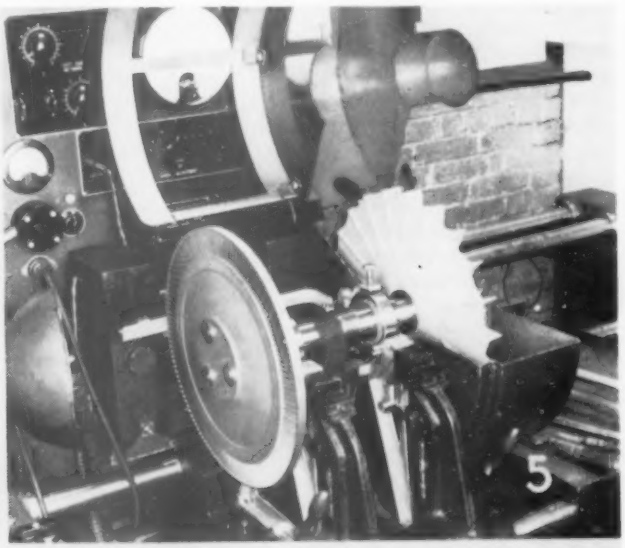
No grinding is permitted in these machines; rather, slight corrections are made on the impeller by hand. A chip pan must be used, and all chips removed with an industrial vacuum cleaner—precautions necessary to prevent contamination of the super-precision bearings on the rotor.

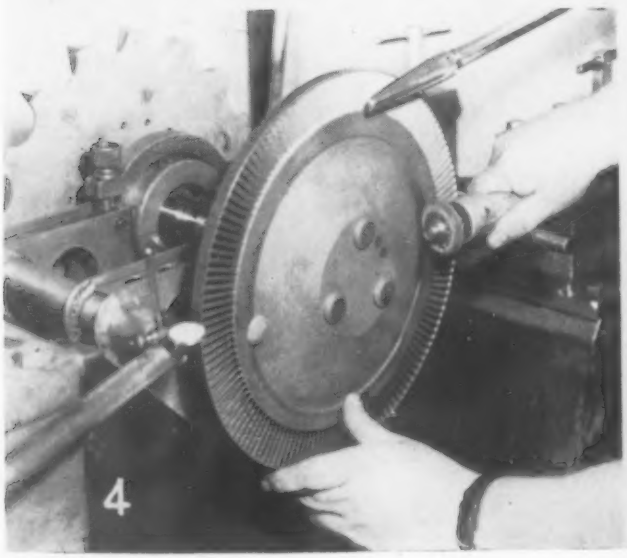
The previous method of hand grinding was too slow and inaccurate to keep pace with the balancing machine, which

FIG. 3, above. Sample of G-E air-driven balancing frame with turbosupercharger rotor in running position. FIG. 4, below. Early sample of G-E air-frame balancing machine. View shows old method of hand grinding.

FIG. 5, above. Balancing machinne, with rotor for G-E aircraft gas turbine in running position. FIG. 6, below. Stock removal grinder, with rotor of turbosupercharger in grinding position.







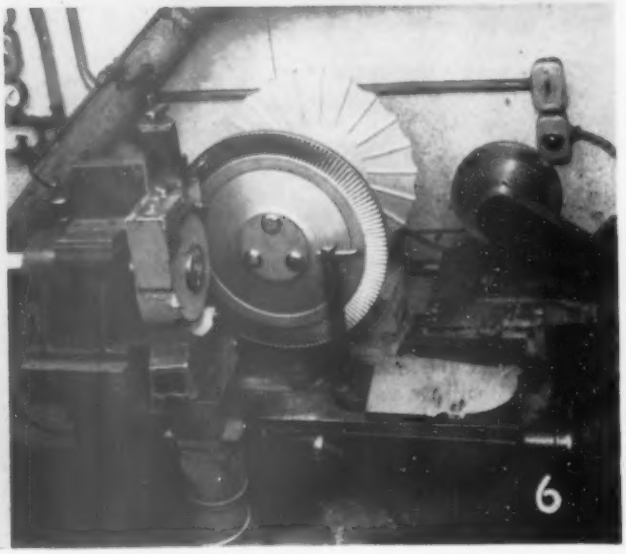


FIG. 7. 120-degree grinding cut, produced by stock removal grinder, on turbine wheel for turbosupercharger.

can measure and locate unbalance in a few seconds. A stock removal grinder was therefore developed for grinding material from either rim of the bucket wheel, as shown by Fig. 6. This grinder is used when the rotor is balanced as a unit by correcting after final assembly, and produces a cut as shown in the inset, Fig. 6. The advantages of this grinder over the previous hand method are (1) accurate calibration, which makes it possible to remove the exact amount of material to an average accuracy of 95 per cent; (2) rigid grinding set up and proper grade of wheel provides uniform finish and appearance; (3) pressurized bearing cartridge which prevents grinding dust contaminating the super-precision ball and roller bearings on the rotor; and (4) considerable time saving.

The time saving obtained by using this grinder is due to the fact that the operator can predetermine, within 5 per cent, how much to grind to correct any unbalance. The grams of unbalance, divided by a grinding factor, equals thousandths of an inch to be ground. An accurate correction method is a necessity, on any balancing job, to obtain the minimum possible balancing cost. If possible, the correction method should be accurate within the balancing tolerances, as this will eliminate more than one balance recheck after correction. This is particularly important when the work cannot be corrected in the balancing machine, and on large work.

The later, larger model superchargers require individual dynamic balancing of the bucket wheel-shaft assembly and the impeller assembly. In order to dynamically balance the bucket wheel, a comparatively large amount of material must be removed from each side because the two balancing planes are less than $\frac{3}{4}$" apart. There is not enough material available on the wheel rim to make the necessary correction, but, as material is available on the web section between the hub and rim, 16 inch rotary surface grinder was modified to provide an improved grinding method.

The following modifications were necessary on this machine; (1) The standard magnetic chuck was replaced with a T-slotted face plate; (2) the spindle was bored out to admit the rotor shaft; (3) a hydraulic jack attachment was installed to quickly change the table tilt; (4) size blocks were made for various tilt angles required; and (5) increased table tilt was obtained. This grinding method removes a maximum amount of material at the point of unbalance, and blends the cut into the web of the bucket wheel to prevent sudden changes in cross section which would produce stress concentration during operation.

This type of grinding out is obtained by the following set-up and tooling: The table is tilted to the correct web angle of the bucket wheel. In order to grind one-half of the web only, the bucket wheel is clamped to a wedge-shaped tilting ring, which is designed to provide a runout of the bucket wheel web equal to twice the allowable depth to which the web can be ground at the deepest point, as shown in Fig. 8.

In this way, one-half of the web area will be ground when the maximum allowable amount of material has been removed, as shown in the drawing, Fig. 9. The unbalance is corrected by lining up the "heavy" point of runout of the support ring, and the amount of unbalance determines the depth of the grinding cut. A bushing centers the wheel for clamping when the shaft is down, and a spider type gage centers it when the shaft is up.

Cost Reduction

Rotor testing requirements make it necessary to assemble and balance every rotor twice:—high-speed assembly and balance for "high-speed test", and final assembly and balance prior to the assembly of the rotor in the supercharger for "operation test." Originally, all the production parts of the final rotor, except bearings, were assembled and the rotor balanced by grinding the wheel and by cutting material from the impeller. Material again had to be cut from both ends for final balance due to different ball and roller bearings and other changes. This duplication of stock removal was expensive, and detracted from the final appearance.

The problem of balancing for high speed test, without removing material, was solved by ideas submitted through the General Electric "Suggestions Sytem." One suggester received an award of $400.00 for his ideas. These rotors are now balanced on the wheel end by adding "balancing washers" to one or more of the three protruding bolt heads.

The balancing operator is provided with a rack filled with nine sizes of washers, retained on the bolt heads by a lockwire. On the impeller end, two larger washers, a locating hub, and two locking screws are assembled by the assembly operator. The large washers have flats on one side, to provide the necessary unbalance, as shown by Fig. 10, and the balancing operator corrects the impeller end by adjusting the two washers and tightening the locking screws.

This improved method of balancing with washers for high speed test, combined with several method improvements—as, for example, principally balancing in the dynamic balancing machine instead of the air frame—reduced the labor

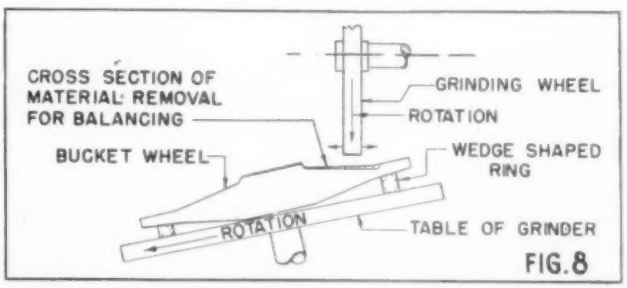
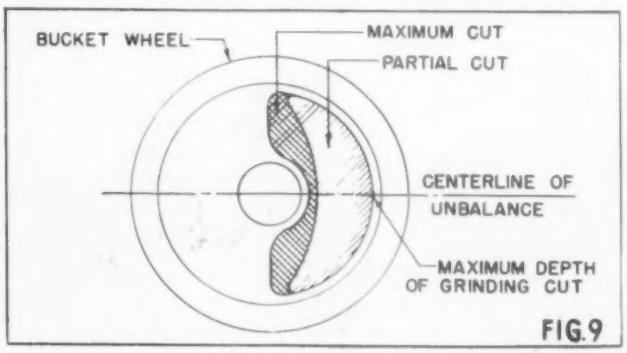


FIG. 8, above. Stock removal web grinding setup; FIG. 9, below. Stock removal from turbosupercharger turbine bucket wheel. Plan view of finished cut.



cost from 2.2 hours day-work to less than .2 each on piece work. This is a reduction of 91 per cent.

The previous method of balancing even the smallest rotor required from 4 to 6 hours of the operator's time. These rotors were dynamically balanced as a unit only—that is, by removing material from the wheel end and impeller end. The latest type rotor is twice as heavy and must be handled with electric hoists; as a result, the balancing work is nearly tripled because the two major parts (the wheel and the impeller) are each dynamically balanced by removing material from two planes and the final rotor assembly is also balanced as a unit.

In spite of the greater amount of balancing and handling required on the later rotors, the total balancing and stock removal time has been reduced to slightly over two hours each. If these rotors were balanced equivalent to the smaller type, each rotor would require less than one hour total, as against the original average of 5 hours. Further advantage is that most of the operations are now on piece work, instead of day work. Greater machine output is obtained under piece work operation. At present, three times as much balancing work, plus the extra handling cost of the heavier rotor, is obtained with a savings of 60 per cent of the original cost of final balance.

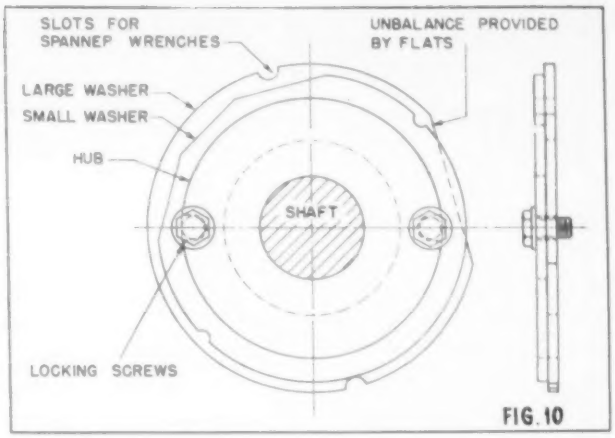


Fig. 10. Balancing washers for high speed rotor, impeller end elevation.

New High-Speed Motor May Revolutionize Internal Grinding

EVENTUALLY INTENDED for grinding holes 1/16" and smaller, an experimental motor now undergoing tests at the Bryant Chucking Grinder Company, Springfield, Vt., is running at sustained speeds in excess of 204,000 rpm. The unit is a 3-phase induction type, operating on 3,400 cycle current.

The rotor, which has a surface speed approximating 600 mph, with the outward force measured in tons, is integral with the wheel spindle which, oil-mist lubricated, is carried on precision ball bearings. The housing is cooled by a water jacket. While a "future," since Bryant does not expect to put it on the market for some time, the development nevertheless portends marked advances in internal grinding.

A Correction

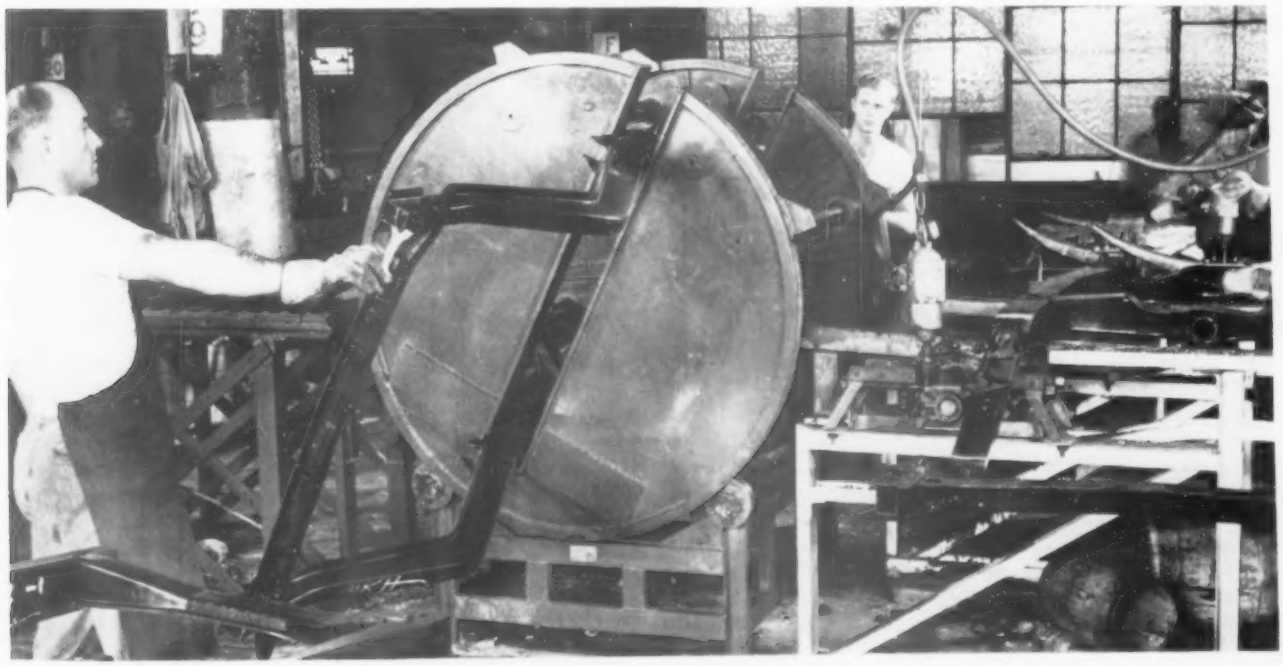
IN THE ARTICLE—"Master Gaging for the Involute Curve"—by C. H. Bodner, December THE TOOL ENGINEER, an error occurred in the author's biography. Mr. Bodner was employed by the Lockheed Aircraft Corporation, not by Consolidated-Vultee, as stated.

The Editors

Simple Roll-Over Fixture For Automotive Frames

A SIMPLE ROLL-OVER FIXTURE, which may be modified to suit other work, has been developed by tool engineers at the Studebaker Corporation, South Bend, Ind., for use in the company's frame assembly line. The fixture, which has eliminated the former hoist and sling method of turning frames in the circumscribed space of the assembly line, consists of a slotted drum which turns on four ball-bearing rollers attached to a welded base.

Two workmen push the frame, which comes top-side up, into the slots and then roll the drum 180 degrees for final upsidedown operations. Stops on the periphery of the drum align the slots for both incoming and outgoing frames.



by Charles E. Lambert *

Accurate Drilling Without a Jig

In which a simple tool solves a knotty production problem

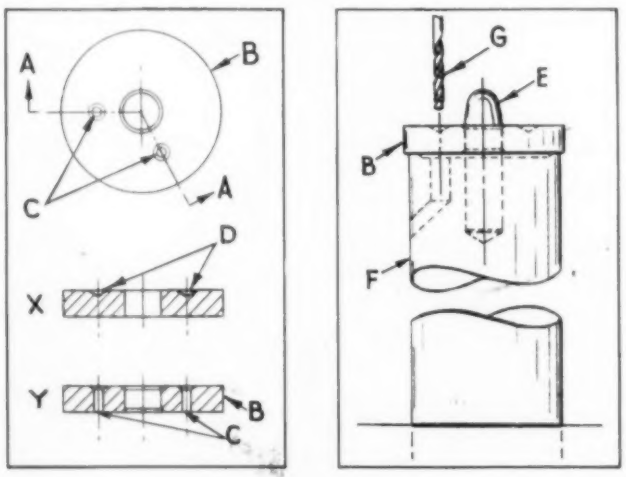
A CERTAIN CONTRACT called for a fairly large production of balance wheels (shown enlarged at B, Fig. 1), which are components of a small clock-like mechanism. The specifications for these brass parts required that two .020" diameter holes, "C", be maintained in size and position within a few tenths tolerance.

In accordance with standard practice, a drill jig was made, but it was soon determined that (1) a jig would be too slow in loading and unloading for the production needed; (2) that the drill was too small to pull even the light jig into position, so that the balance wheels would not fit the gage; and (3) that a high-speed drill press was not fast enough, or sensitive enough, for this operation.

The processing was then entirely revised so that the pierce and blank die also included putting in two accurate dimples, or spots "D", for the location of the two .020" holes. After both sides of the center hole were countersunk, the balance wheel was placed over pin, "E", located in the simple stud fixture or "anvil" shown in Fig. 2. One spot was located by eye under the drill, and one hole was drilled.

A rotation of the balance wheel between thumb and forefinger positioned the other spot and the second hole was drilled. Pin "E" was made smaller than the center hole of the part to enable it to float so that the drill would locate

Fig. 1, left, shows Section A-A- after being completed. Fig. 2, at right, is an enlarged view of the anvil.



* Mr. Lambert is Process Engineer with the Underwood Corporation, West Hartford Conn.

Fig. 3. The "Jigless Jig" as set up for production. A fixed magnifying glass provides visual aid for seeing the tiny workpiece.

the balance wheel accurately by means of the spots. The top of the anvil F was undercut in the center for chip clearance.

In order to obtain the proper speed of 20,000 RPM, a small air-grinder (see photograph) was mounted on the column of a sensitive drill press in place of the drill head. Instead of lowering the quill, the feed on this machine was obtained by raising the table. Anvil F (Fig. 2) was positioned at the proper radial distance from drill "G" and was secured to the table.

A fixed magnifying lens, and a light close to the work, were found necessary in order to see clearly, as the drill and the spot were so small. By these means the balance wheels were drilled accurately, cheaply, and at a high rate of production.

Detroit to Initiate "University" for Graduate Students

A "NEW" IN ENGINEERING EDUCATION, recently announced by the Council of the American Society of Mechanical Engineers and sponsored by the Engineering Council for Professional Development, is the establishment of a series of "universities" in key cities, throughout the nation, for graduate engineers. The pilot operation, already under way in Detroit, will work in that city with the Engineering Society of Detroit, and its thirty or more affiliated technical societies to give courses, lectures and consultations to engineering graduates. The Detroit groups will work under direction of James W. Parker, of that city, who is Chairman of the E.C. P.D. "Regents" of the new university will be past presidents of the ASME, and the faculty will consist of outstanding engineers in active duty.

According to Eugene W. O'Brien of Atlanta, president of the ASME: "This plan has been devised, not as a criticism of present engineering schools, but as a new aid to the engineer just out of college and starting his professional practice." Tests of high school students, down to the 10th grade, to measure engineering aptitude, were recommended by Mr. O'Brien as another phase of the Engineers' Council program. Thus, the Council "hopes to justify improved earning power and to accelerate progress for the next generation of engineers."

by **James Walker**

34-92000

Drawing Dies for Magnesium

A late arrival in the metals field, magnesium opens up vast possibilities for future developments

Installment No. 9 of a Series on Drawing Die Problems and Formulae

THE EXPANDING UTILIZATION of magnesium, and the almost unlimited possibilities of this ultra-light metal, have created a large demand for information regarding its engineering properties and methods of fabrication.

Magnesium is the lightest metal known to date and, like many other metals, lacks sufficient strength in its pure state for the average commercial use. However, when alloyed with such elements as zinc, aluminum and manganese, strength is added to lightness to produce the greatest strength to weight ratio of any of the commonly used metals.

While magnesium was discovered back in 1808, commercial utilization did not take place until a century later, and it was still available in only limited quantities at the time of World War I. The particular advantage of magnesium is its light weight, which is especially beneficial to the aircraft industry, where weight is an item of vital concern. On an equal volume basis, magnesium is one-fifth the weight of steel and two-thirds the weight of aluminum, and is adaptable to such processes of fabrications as casting, forming, spinning, extruding, drawing, rolling and arc, spot or gas welding.

Must Be Cold Worked

The drawing of magnesium is an art still in its infancy and, up to this time, comparatively little has been written, in comparison to literature on other metals, concerning its working. Consequently, much progress is still to be made, with vast possibilities for future development. Because of its high strength to weight ratio, permissible reduction and high resistance to corrosion, it promises liberal rewards for its fabricators.

To cite an example, the Worcester Pressed Steel Company engineered and developed the drawing tools for the fabrication of the Hamilton propellor dome, formerly a forging that required numerous operations. The Worcester Pressed Steel Co. not only drew this metal, but accomplished such operations as ironing, indenting and upsetting. The material was 0.500″ thickness, AM-C52's plate, and the blank size was 19¼″ diameter.

The first operation produced a drawn cup 9.125″ ID × 10¼″ high—a reduction of 52.5%, and the ironing operation reduced the side wall 33% in thickness for a length of 4½″. The above example is definitely a significant contribution to the art of fabricating metal and is an incentive for those concerned with future problems.

Unlike aluminum alloys, none of the magnesium sheet alloys are heat-treatable and any desired variations in strength and other properties must be obtained by cold working. Magnesium is manufactured by a few companies; however, the principal ones are the Dow Chemical Company and The American Magnesium Company. Magnesium alloy sheet is available only in the fully annealed "O" temper or the hard "H" temper and not in the intermediate tempers. Intermediate tempers are not practical because of the small capacity for cold work of the magnesium alloys.

Obviously, the particular application, and its attendant fabricating requirements, should indeed govern the selection of the proper alloy. It is therefore suggested that those desiring such information contact either of the above companies as a list of the varieties might confuse rather than aid in selecting. For example, certain grades are susceptible to stress corrosion cracking, while heating some varieties of magnesium sheet above 700° impairs workability and tends to introduce a hot short condition. It is also well to consult the manufacturer for recommended heats, as various tests have revealed that certain grades of magnesium sheets show a decrease in tensile strength after reaching 450° for a period of time.

The forming of magnesium alloys at room temperature is not comparable to other commercial materials, and it is not recommended for other than simple bends and very shallow draws. The rapid work hardening, which occurs at room temperature, can be overcome by doing the forming at elevated temperatures. Generally speaking, heating annealed magnesium sheet to elevated temperatures does not affect the room temperature properties. Heating the full hard ("H") sheet to 650° results in properties similar to those of the annealed material.

The decided difference between a magnesium draw die and a conventional die is that provisions must be made for heating the tools at elevated temperatures. The means by which the material is heated depends upon the facilities available. There are several methods for heating the tools—i.e., with electricity, gas, infra-red light, hot oil, hot salt and oxy-acetylene; however, gas and electricity are most commonly used.

Most important also are facilities for controlling and maintaining the correct temperature throughout the production run. Controlling pyrometers, with thermocouple leads to the tools, are desirable to maintain a constant tool temperature. Working temperatures and heating methods can be varied to suit each specific job, and it is therefore advisable at times—and particularly when drawing small diameters in thin gage material—to operate with an unheated or even a chilled punch.

This method provides maximum strength in the area under the punch but still permits maximum ductility in the remainder of the shell where the actual drawing takes place. With punches of relatively large area, cooling of the punch may present an adverse effect, in that the heat conductivity and low heat capacity of the magnesium alloys may result in the chilling of the material beneath the blank holder as well as the punch. It is imperative that the blanks be at the proper temperature prior to and during the forming operation.

Electric and Gas Heating

Relatively thin materials can be heated by placing the blank in the nest with an interval of 30 seconds, preceding drawing, which allows sufficient time for the blank to reach the desired temperature. For thick materials, portable vestibule furnaces with necessary racks can be located near the work station to provide and maintain the required temperature. After the forming operation, the part should be

permitted to cool normally to room temperature as accelerated cooling or quenching will cause excessive distortion and warping.

Electric heaters are satisfactory, although it is sometimes troublesome to install sufficient heating elements due to the irregular contour of the die, or because of insufficient space. Both cartridge and strip heaters may be used, depending on the shape of the die. Temperature is maintained by a controlling pyrometer which operates the circuit heater through magnetic contact. Hand-contact pyrometers are also used with non-controlled heating; however, this method is less efficient.

Whether a burner is necessary within the punch, or around it, depends largely upon the job. For the average shaped draw-die, the punch burner can be eliminated because it will usually absorb sufficient heat from the draw and pressure ring burners. Burners are usually from $\frac{3}{4}''$ pipe for lengths up to 6 feet, and $1''$ pipe for burners exceeding 6 feet and up to 12 feet. The burners should be bent to as near the contour of the draw-ring as possible, and centrally located, but never closer than $2''$ to the inside of the draw-ring.

If it should be necessary to place the burner closer than $2''$, then a shield should be provided to prevent the material from being overheated. The ports are usually drilled No. 40 and spaced at $\frac{1}{2}''$ intervals and so located that the ports are $\frac{3}{8}''$ from the surface requiring heat—that is, if the flame is to burn upward. If the flame is to burn downward, then it should be located $\frac{3}{4}''$ from the surface. Since heating the tools lowers the power required to draw, it is significant that less tonnage is required to draw magnesium than average cold worked metals.

The coefficient of thermal expansion, in magnesium, differs from the expansions of various die materials at elevated temperatures. The punch and die should therefore be multiplied by a coefficient factor to insure parts of the required tolerances. The manufacturers will supply the factors for those who are interested.

Selection of Press

The selection of the press for the operation depends upon the contour and depth of draw, and obviously the deeper and more intricate the contour, the slower the speed should be. There have been many times when an operation was more successful in the faster single-action press than with the slower hydraulic press. However, the parts in question were symmetrical and comparatively small and shallow.

Double-action presses are very efficient and the hydraulic triple-action presses are especially advantageous when draw-

FIG. 1

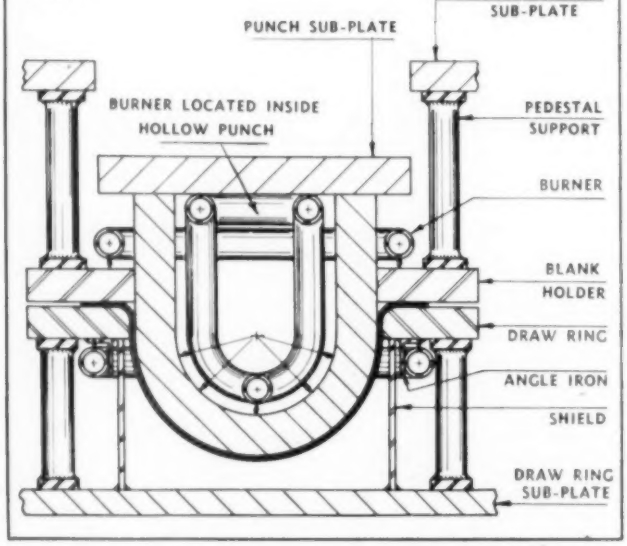


FIG. 1. Hollow punch and draw ring, double action press. Fig. 2. Draw die, single action press.

FIG. 2

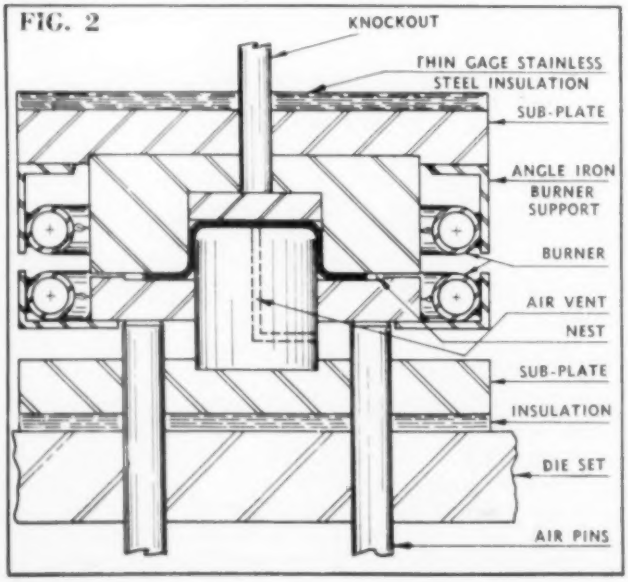


FIG. 3

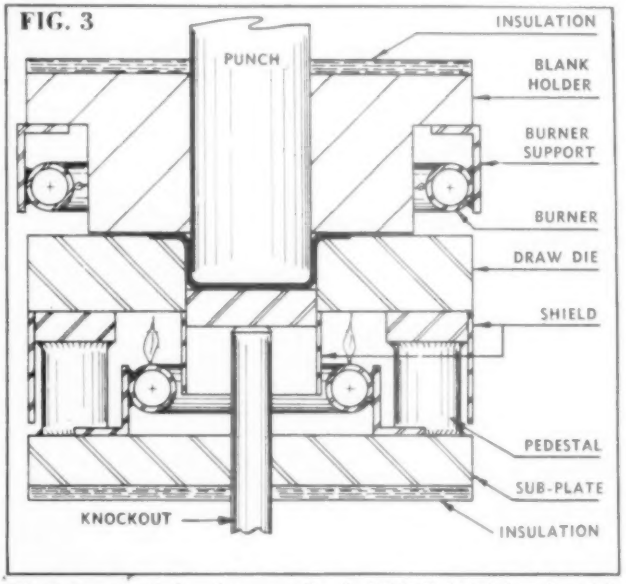
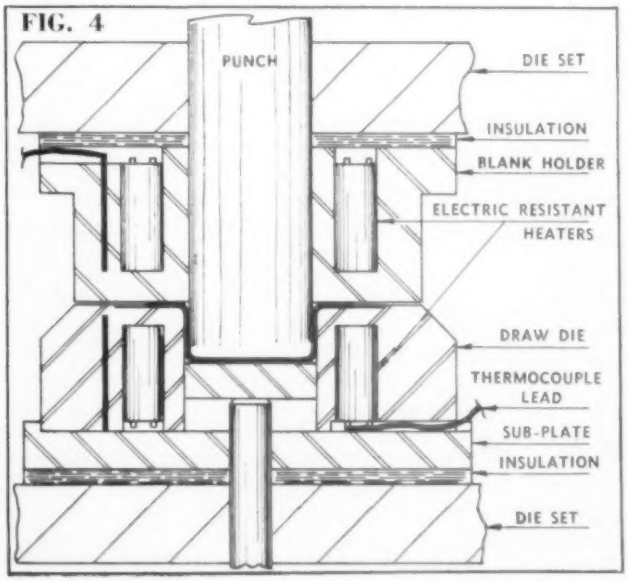


FIG. 3. Draw die, single action press. Fig. 4, electrically heated draw die, triple action press.

FIG. 4



ing irregular contours and for draws of great depth. The triple-action press is also advantageous because of the fact that the drawn shape can be readily ejected after the upper platen has completed its cycle. Hydraulic presses with their slow uniform speed are especially advantageous when drawing irregular shapes, as, for example, medium and deep shapes and all shapes that have small corner radii. However, recent discoveries have proved that double-action toggle presses are superior to hydraulic presses when drawing hemispherical, large bottom radiused and conical shaped shells; moreover, production is also accelerated due to the faster drawing speed of the double-action press. The faster drawing speed seems to aid when confronted with puckering. The reason is that there is less chance for the unsupported metal (distance between the punch radius and the draw-ring radius) to cool, which increases the tendency to pucker.

Lubricants

There is still much to be accomplished relative to a satisfactory lubricant that possesses a high-flash point, has good lubricating qualities at elevated temperatures and which lessens the necessary tool cleaning due to charring, gumming and pickup. The principal objection to most lubricants containing graphite is its dirtiness.

Colloidal graphite has been tried in several grades; however, powdered grades No. 620 (manufactured by the American Graphite Company) suspended in carbon tetrachloride is quite satisfactory, provided the tools are washed at the necessary intervals. A very satisfactory lubricant that proved very successful in recent experiments is Kondor No. 105, manufactured by the Kondor Company. So far, very favorable results have been achieved with this lubricant. It is very easily removed; however, high production quantities have not been tried thus far.

If colloidal graphite is used, the sheet stock should not have chrome-pickled surfaces as it is very difficult to remove the graphite particles that become embedded in the sheet. The sheet should be ordered in the oiled condition. Magnesium sheet may be used with either oiled or chrome-pickled surfaces when oil type forming lubricant is used. In the event chrome-pickled sheet must be used, and colloidal graphite is employed as a lubricant, then the chrome-pickled surface should be removed by immersing from one to fifteen minutes in the following solution maintained at room temperature: Chromic acid (CrO_3) 1.5 lbs., and water to make 1.0 gal. This treatment is followed by washing and drying.

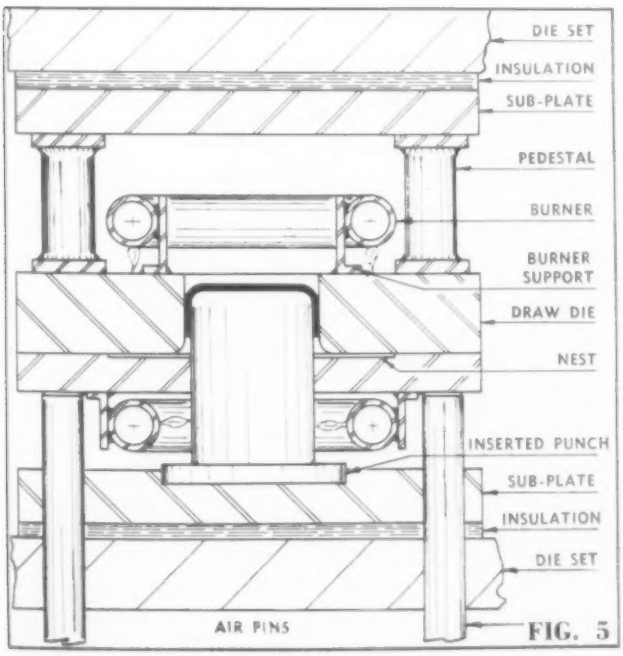


FIG. 5

After the forming operation, parts which have been lubricated must be given a preliminary cleaning in a vapor degreaser or an alkaline cleaner. This procedure is followed by cleaning in the same chromic acid solution used to remove the chrome-pickled surface. *Note*, however, that chromic acid solutions will not remove a graphite lubricant; therefore, a satisfactory removing agent is recommended as follows:

Chromic Acid (CrO_3)	1.5 lbs.
Calcium nitrate ($Ca(NO_3)_2 4H_2O$)	4 oz.
Magnesium nitrate ($Mg(NO_3)_2 6H_2O$)	4 oz.
Water to make	1 gal.

The solution is maintained at room temperature and the parts are immersed 2 to 5 minutes. After cleaning, the parts are washed in cold running water, followed by a dip in hot water to facilitate drying. This solution is also satisfactory when oil lubricants are employed.

Die Design

Most of the data and literature available for the drawing of magnesium recommend that the die and its components be made of mild steel. The author disagrees with the above recommendations and suggests the use of a hot work-tool steel for comparatively small dies and Meehanite—or some other good grade cast metal—for large dies. Nitrided steels and chromium plated tools have also proved advantageous; however, quantity and quality are the main factors that should govern the tool steel selection. Mild steel might prove satisfactory for a low production run; however, it warps easily at elevated temperatures, or during case-hardening, and also galls very easily when left soft.

It is vitally important to "beef" the tool construction at least 30% over conventional types to prevent warpage at elevated temperatures. All tools should be provided with insulation between them and the die set to insure minimum heat reaching the press platens. See Figs. 1 to 5, and Fig. 8.

For the average run of work, the die should be designed making use of the open-type construction, as shown in Fig. 1. This type construction is very economical because (1) it allows a great saving of metal and (2) also eliminates machining the die to the exact contour of the punch. The blank is merely clamped between the blank-holder and the draw-ring, and as the punch descends the metal follows the contour of the punch. The above suggestion should always be tried first; then, in the event it should fail, the draw-ring can be discarded and replaced with a contoured die.

FIG. 5, left. Figs. 1 and 5, inclusive, show various methods of constructing heated dies for magnesium drawing. Fig. 6, below, is a schematic diagram of piping and burners, particularly illustrates the ring burner and mixing unit for gas heating of drawing dies. The tips—"T"—are 1/2" blast tips (port area 0.0224 sq. in.) spaced 1 1/4" apart, approximately = 6,250 BTU per hour at 5 in. mixture pressure.

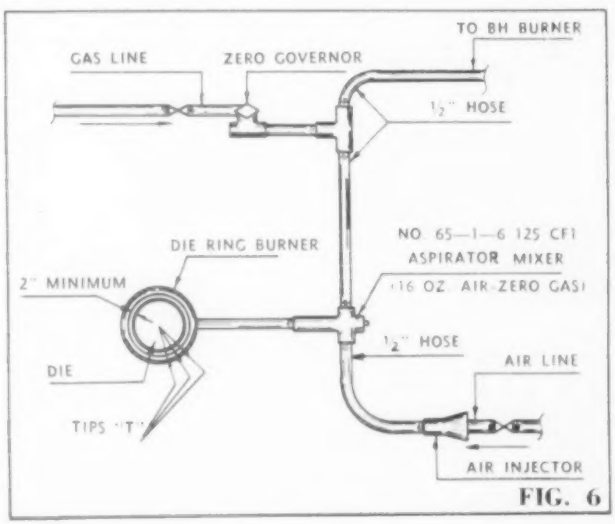


FIG. 6

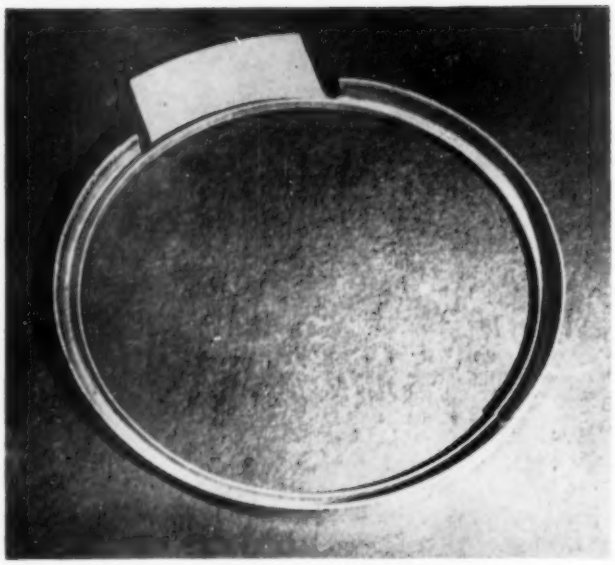


FIG. 7. A combination stretch and shrink flange.

It must be borne in mind that, when open-die construction is employed, greater blank-holding pressure is necessary because of the greater unsupported distance between the punch and the draw-ring radii. The thinner the material, the more pressure required. Large blank diameters also require greater blank-holding pressures to prevent wrinkling. Consequently, the force necessary to overcome friction is higher for large diameters and a corresponding higher force is imposed on the cup wall during drawing.

Therefore, less percent reduction is obtained for cups of large diameters under conditions where other factors are equal. Also, as the blank-holding pressures are increased, the tendency to rupture is increased. Heating the dies and the material, however, permits greater reductions because lower permissible hold-down pressure, at elevated temperatures, results in less frictional resistance to drawing under these pressures.

During drawing operations, an appreciable amount of thinning of the wall takes place just above the radius of the punch, and thickens gradually in its rise until it reaches the top of the cup or the edge of the flange, as the case may be. The thickening amounts to the percentage of clearance required between the punch and the die. If the clearance is reduced, ironing is introduced, therefore, inexcessive clearance can also be responsible for ruptures because the ultimate load, during ironing, frequently exceeds the maximum load that a cup can resist.

The use of magnesium punches should not be overlooked, when confronted with low production runs, because it machines very easily and its light weight facilitates set-up time and the necessary calculations for heat expansion can be ignored.

Structural Construction Recommended

Due to the bulkiness of magnesium dies, the construction should be structural, making use of I-beams, channels, heavy pipe, and so on. Whatever the selection may be, use a welded construction wherever possible and be sure to stress relieve all welded components before final machining. It is also advisable to secure the welded components to their respective sub-plates, making use of cap screws and dowels. Do not weld the structures to the punch and die sub-plates, as removing them at intervals for necessary reworks and polishing will be hindered.

The distance between the pedestal supports and the edge of the die opening should not exceed three or four times the thickness of the draw-ring. The thickness of the blank-holder (in the case of the double-action press) or the pressure-ring (in the case of the single-action press) should be at least 15% of the blank diameter but not less than 1½" thick. The thickness of the draw-ring, or draw-die as the

FIG. 8. Construction of the die used to form the combination stretch and shrink flange shown in Fig. 7.

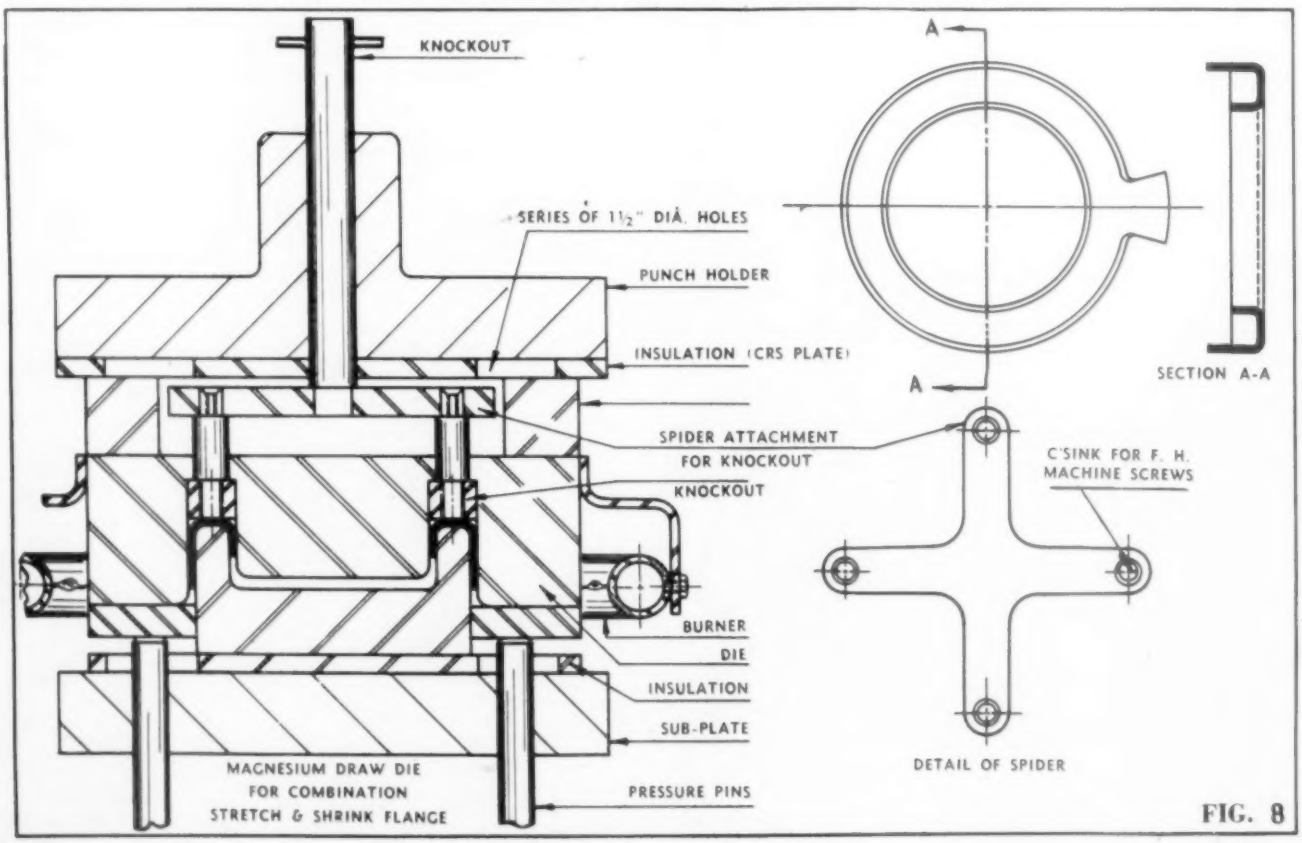


FIG. 8

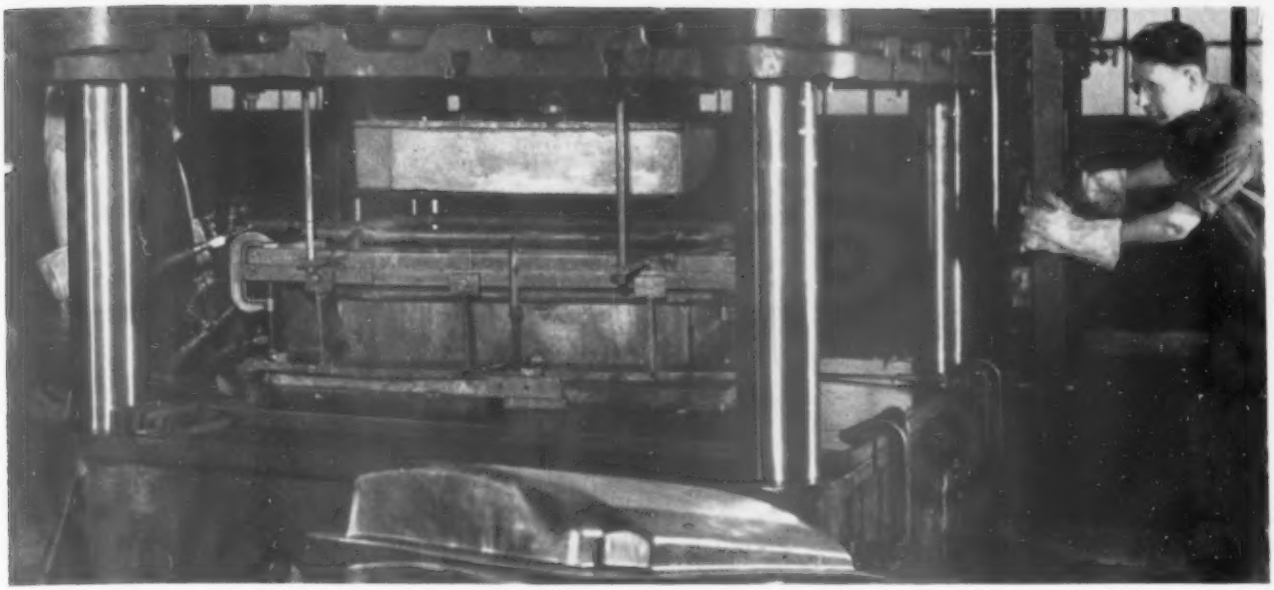


FIG. 9. Draw press, as tooled for drawing the irregular magnesium pans shown in foreground. The blank holder and die are both gas heated.

case may be, should be at least 20% of the blank diameter but not less than 2″. The clearance between the pressure-ring or the blank-holder should not be less than 0.015″ to a side.

Clearance and Radii

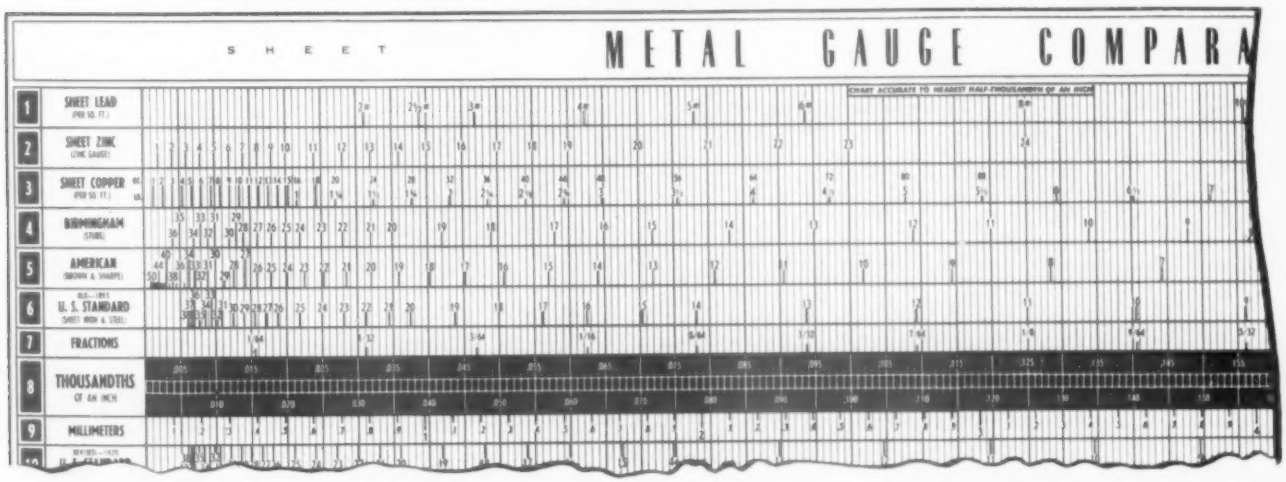
The clearance between the punch and the die should be greater for magnesium than for aluminum, steel, copper or brass. The general clearance provided is t plus .12(t) to t plus .18(t) to a side, or in other words, to find the die dimensions, multiply the punch diameter x 2.24 to 2.36.

The size of the radius of the punch has no particular influence on the depth of the draw that can be obtained; however, too small a radius increases the possibility of bend cracks. The die radius is not so effective relative to bend cracks, however, decreasing the die radius decreases the drawability of the material—and increasing the die radius excessively increases the chance for puckering. A good practice to follow is, use an 8t radius for the punch, and a 6t radius for the die.

Allow sufficient corner radii wherever possible as these radii largely govern the depth of draw.

End of part 9 this series. Installment No. 10 will follow in February THE TOOL ENGINEER.

METAL GAUGE COMPARATOR CHART



An unusually comprehensive comparator chart, published by Twin "K" Products, 2322-62 Newport Ave., Dayton 5, Ohio, gives the equivalents of various standard sheet metal and wire gauges in thousandths, fractions, millimeters, mils, and circular mils. The gauges so interpreted are Sheet Lead, Zinc and Copper; Birmingham (Stubs); American (B & S); U. S. Standard (old and new); U. S. Steel Wire (formerly W & M); Piano Wire (Am. S & W Co.); British (Imperial) St'd and Stubs Steels Wire. Measurements are shown up to ¼″ in increments of .001″.

The Chart, of which a small section is shown above, measures 23″ x 10½″, is printed on heavy, durable cover stock and is offered in quantities, with imprint, to manufacturers who may wish to present it to customers as a good will item. However, individuals may obtain copies direct from the publisher. Indexed to tell which gauges are applicable to the various classes of sheet metals, wire and tubes, it clears misunderstandings and confusion by specifying thickness or diameter in addition to gauge numbers.

by D. E. McDonald

Centering Tool for Milling Cutters

Centering and offsets quickly accomplished by means of a simple device

IT IS OFTEN NECESSARY, in milling machine operations, to center the milling cutter in relation to one of the table slots. While there are many ways of doing this, including setting to a key inserted directly into the slot, it is usually necessary that the table be clear of fixtures or other interferences.

A simple, yet handy and efficient device for cutter centering, shown in Fig. 1, consists of a base, Det. 1, and a vertical blade, Det. 2. The base has a key (K), ground a plug fit to the table T-slot, and a slot in its upper side, the latter dead in line with and the exact width of the key K. As an alternative, the base may have two slots, diametrically opposed and dead in line, as in inset A. When so made, interchangeable stepped keys may be used, the idea being to maintain an exact center relationship.

Det. 2 is hardened, all but the section which fits into the slot in the base, which is ground soft, to fit, and then drilled and tapped in place, as indicated in inset A. The base may be left soft although, in view of the accuracy necessary, the bottom surface, key and slot are preferably ground. After final fitting and assembly, the surface X is ground at exactly 90° from the horizontal and exactly central with the key K.

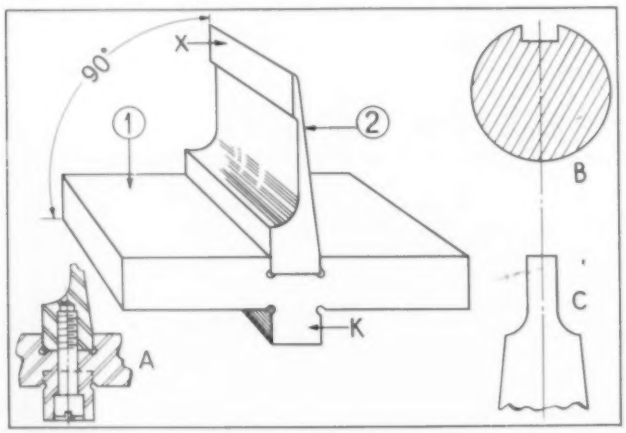
In setting up, and taking as an example that it is desired to cut a 1″ keyway in a shaft (as at B, Fig. 1) held in two Vee-blocks, the centering tool is located on the miller table, key K in the T-slot. The table is then adjusted so that one face of the cutter just touches the surface X, which means that the face of the cutter is then central with the table slot. Then, assuming that the cutter is 1″ wide exactly, it is only necessary to move the table .500″ for accurate centering.

For extreme accuracy, however, the cutter should first be measured, then rotated, and any possible runout should be checked with an indicator. Adding twice the runout to the measured width, and dividing by 2, will give the required table movement for accurate centering. For ordinary keyway milling, however, the method described in the preceding paragraph will suffice.

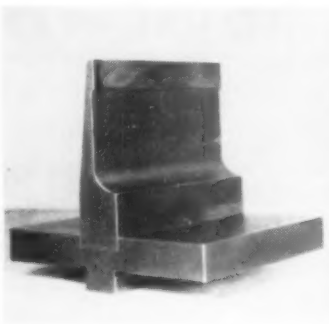
Another application, among several, is the milling of a tang, as shown at inset C. Again assuming the width of a cutter to be 1″, and the width of the tang ½″, one face is brought to bear against surface X as before, after which the table is moved outward .250″ to machine the first side. The table is then moved inward 1.500″ to cut the opposite side. Thus, no indexing fixture is necessary. For straddle milling, however, it would only be necessary to touch the inside face of one cutter to surface X and then move the table .250″.

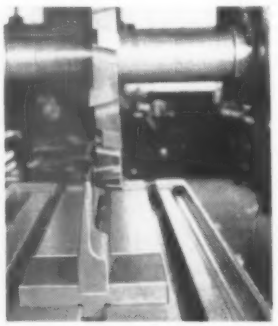
The photograph, Fig. 2, shows the device as actually made up, and Fig. 3 shows it set up, on a miller table, with a cutter just contacting surface X. This device can also be advantageously used on shapers and planers to locate the position of cutting tools.

*Factory Superintendent, O.K. Tool Company, Shelton, Conn.



The line drawing (Fig. 1 at left) shows the construction of the tool. At right (in photo, Fig. 2) the tool as finished and also as set up for centering.





Now! -- Tungsten Plated To High Speed Steel

A NEW DEVELOPMENT, so revolutionary in nature that its manifold applications can only be roughly surmised at this time, is a process for plating tungsten on high speed steel. Experiments carried out at Raymetal Company, Walled Lake, Michigan, under direction of Dr. Raymond Nauth, have so far shown that tungsten can be successfully plated on high speed steel cutting tools, to thickness of .006″, and that this plating will not flake off under heavy cuts.

Of particular interest is the implication that the tungsten plating can be converted to tungsten carbide. What this may portend in future development of cutting tools is anyone's guess at this time; according to Dr. Nauth, however, tests conducted on machines that were not originally designed for carbide tooling have shown that performance of these machines has been improved remarkably with use of the tungsten plated tools.

Drills may be plated, especially in the flutes, so that successive grinding will leave the tungsten plating intact on the cutting lips, materially increasing tool life between grinds. Tungsten plated to non-ferrous metals may also have a considerable bearing on X-ray and laboratory equipment. For example, tungsten is said to have shielding qualities up to ten times that of lead, thus .006″ of tungsten plated on both sides of a non-ferrous plate would have the equivalent shielding quality of roughly ⅛″ of lead. While still in its laboratory stages, the new process has nevertheless been subjected to rigorous tests and, according to Dr. Nauth, proven practical for industrial uses.

by Watson N. Nordquist

34-99000

Development of Economical Jig Grinding

High speed grinding attachment meets need for accurate conversion tool

LONG BEFORE WORLD WAR II, toolroom and die shop executives realized that new methods were needed for correct location of holes in hardened tool components. The usual method, then practised, of clamping the workpiece to the face plate of internal grinders was slow and, because of vibration caused by unbalance of the rotating part, the accuracy achieved was not meeting the growing demands of industry for high precision. Futhermore, annealing and rehardening often distorted the steel blocks beyond salvage.

As a result, the principle of jig grinding began to develop in the minds of a few tool specialists. It was known in theory that, if it could be perfected, jig grinding would be the answer to many problems involved in the accurate location of holes in a piece of steel. And the answer became imperative when, at the beginning of World War II, procurement agencies clamped almost unheard of close tolerances on specifications for war material. Almost overnight, industry began thinking in terms of thousandths and even millionths, and precision became the key to passing inspection, especially in the case of tools, dies, fixtures, and gages. This sudden demand for greater precision forced the principle of jig grinding out of the theoretical plane and into the practical.

Consequently, several concerns that had been experimenting with jig grinding brought out precision machines, and today jig grinding is recognized as the very latest method of accurately locating and finish grinding holes in hardened steel. It is now realized that jig grinding achieves the highest precision in such operations, thereby improving the quality of tools, dies, jigs, and fixtures which, in turn, improves the quality of the end product. At the same time, jig grinding increases production by greatly reducing the time needed to locate and finish grind holes by the old methods.

The common practice in jig grinding, today, is to rough jig bore or rough drill the hole in soft steel, allowing sufficient stock for grinding. After the part has been hardened, the hole is then quickly relocated and jig ground to the closest desired tolerances. As in the case of many other comparatively small concerns, suddenly converting from the manufacture of consumer goods to war work, the engineers of the Vulcan Tool Company, Dayton, Ohio, recognized the potentialities in jig grinding, but logically felt that the highly specialized machines were too expensive to be universally accepted by the average small shop.

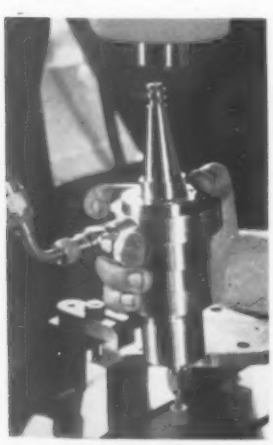
For Low-Cost Operation

To meet this problem, the idea was conceived to design and build a high speed, cool running instrument which could be attached to a standard machine tool, such as a jig borer, boring mill, or other precision machine tool. Such an instrument would not only be inexpensive, in their opinion, but at the same time would double the utility of the machine tool used as a holding base, thereby making jig grinding truly a low cost operation. In other words, the instrument would be an attachment, to be put on or taken off in the same manner as a boring chuck and which could be used in any part of a shop where jig grinding was required.

With this basic idea as a starting point, they then tackled the difficult problem of high speed, which is the basis of jig grinding. Realizing that internal grinding wheels were less efficient than other wheels because of the extreme change in wheel diameter with no corresponding change in spindle speed, they incorporated into the attachment the feature of controllable speeds from 30,000 to 65,000 RPM. This was to compensate for the varying diameters of the grinding wheels, since the surface speed of the wheels could be increased as the diameter became smaller.

Various types of material, such as aluminum and bronze, were tried for the instrument's rotor and body. At 65,000 RPM, however, these materials naturally disintegrated, and it was finally found necessary to use alloy steel throughout. Laboratory tests, consisting of hundreds of hours of running at high speeds, established that the material selected fulfilled the necessary requirements. Super-precision bearings were used, and it was found necessary to build a fixture for

At left, the Vulcanaire attached to a jig borer, doing a jig grinding operation. A portion of the dust collecting system can be seen below the workpiece. At center, the Vulcanaire jig grinding attachment and its accessories—dust elimination system, speed regulator, oiler and air filter, the latter by C. A. Norgren—mounted in compact form for use on a machine tool. The photo at right shows how the attachment, with controlled speeds up to 65,000 RPM, can be quickly placed in the spindle of a jig borer or other machine tool in which jig grinding is to be performed.



preloading these bearings so that complete accuracy could be held in the instrument's construction; also, to make certain of cool-running operations at such high speeds, air with a fine mist of oil was continuously passed through the spindle ball bearings.

Having satisfactorily perfected a cool running, high speed jig grinding instrument that could be attached to many different machine tools, there remained the difficult problem of dust elimination. Realizing that no one would use such an attachment on highly precisioned machine tools unless there were adequate safeguards against grinding dust, a simple air-operated vacuum attachment, with no moving parts, was tried out.

Attachment Broadly Applicable

In addition to this attachment, an aluminum holder was developed to be placed under the workpiece when grinding, and a plastic shield was designed for use when diamond dressing the grinding wheel. This equipment, which is standard for many highly expensive machine tools, was successful in drawing off the dust during grinding or wheel dressing. It was also found that an air line cleaner and oiler and a speed regulator were necessary for efficient operation. These were mounted in series so as to facilitate moving the instrument from one machine to another, according to where jig grinding was required.

When the Vulcanaire (as the grinding instrument and its accessories come to be known) was finally perfected, many new uses became apparent other than that of accurately locating and finish grinding hardened holes in steel blocks. On a jig borer or vertical mill, for example, the Vulcanaire was used to grind down holes square with a ground base; to move location of holes in hardened steel blocks; to grind interchangeable holes in hardened sections; to grind radii in die sections; to grind contours in gages; to grind 0.032″ to ⅛″ holes with diamond impregnated laps; and to grind contours and reliefs with tungsten carbide burs.

With the Vulcanaire adapted to a surface grinder, it was used to grind ⅛″ or larger slots, either horizontally or vertically, and to grind odd-contour punches to size with the diameter of the wheel forming the radius to the base. Attached to an internal grinder (grinding sintered carbide or tool steel), it was found possible to remove stock considerably faster—in some cases as much as five times. On a lathe, the attachment was employed to grind centers in ling shafts; on a large boring mill, to grind holes in large steel castings; while, on duplicating machines, contours or shapes could be ground after the part was hardened.

These were problems solved in the Vulcan toolroom, and from the many experiments and improvisations by necessity there was developed an accessory, now available to industry, which is broadly applicable to a wide range of toolroom, die shop, and production uses. Like many another war-born development, it broadens the use of standard machine tools without in any way interfering with the functions for which they were designed.

Letters to the Editors

The Tool Engineer
Gentlemen:

I have just had opportunity to read an article in the May issue of your Magazine. . . . New Diamond Die Drilling Method . . . on page 35. I note in the second paragraph . . . the statement that wire finer than .015″ in diameter can be drawn only by diamond dies. We will agree with the statement on the drawing of brass and phosphor bronze; however, we wish to advise that we have thousands of dies in the market today drawing high carbon steel wires under .015″.

During the war, thousands of tons of .009″ wire was drawn through carbide dies and we know of a few cases where steel wire as low as .006″ have been drawn economically through carbide dies. We feel that the above should be called to your attention as this article may give some people the wrong impression of tungsten carbide dies.

Yours very truly,
A. E. Glen
Manager of Die Sales
Carboloy Company, Inc.

While the article in question dealt primarily with the drilling of diamond dies, thus superseding previous and slower methods, it is entirely possible that the authors had in mind the drawing of non-ferrous wires and thus overlooked the remarkable qualities of tungsten carbide dies. We thank Mr. Glen for his very informative letter.

The Editors.

The Tool Engineer
Gentlemen:

In your August 1947 edition, under the subject "Drawing Die Problems and Formulae", pages 31 to 33, it is stated that, during a drawing operation, the shell will cling to the punch—therefore, the size of the punch will cover the size of the shell. Our problem is to hold the outside diameter of the shell to the tolerance plus or minus .002″. The material used has a tolerance plus and minus .003″. It is the writer's contention that the die will be the controlling factor of the size when the outside diameter is the important dimension. Can you answer this question so as to settle a dispute?

Very truly yours,
H. Walsh
Manning, Maxwell & Moore, Inc.

While we can't promise to settle a dispute, we would say that the die governs the O.D. of a drawn shell when the O. D. is the important consideration. Where the stock varies .003″ per side (total thickness .006″), the punch should be made to suit the lesser thickness—or oversize for the thicker. Then, the die would act as a burnisher as well as a sizer. As for sticking, the shell may stick to either the punch or the die. Such an occurrence is hard to predict and is usually ironed out in tryout.

The Editors.

Notes on Numerical Index

Starting with the December number, THE TOOL ENGINEER, all major articles will be keyed with the ASTE Data Sheet Numerical Index. However, this index system will apply only to tangible matters, such as tools, equipment, products and processes directly; related to solid substance. Articles on purely academic subjects will not be indexed.

The ASTE Numerical Index is further tied in with the United States Standard Commodity Classification, Volumes 1 and 2, copies of which may be had from the Superintendent of Documents, Washington, D. C., at $1.25 per volume. By means of this Index System, readers may file all articles, published in THE TOOL ENGINEER, or any other information matter, according to classification. Thus, articles under dies —as, for example, the series now running on Drawing Die Problems and Formulae—under No. 34-60000.

In addition to this System of Indexing, a complete Index of all articles published in Volume XIX, THE TOOL ENGINEER, will be published in the February number, or No. 1, Vol. XX, and a complete Index of all articles previously published in the new THE TOOL ENGINEER will follow as fast as it can be prepared.

by Paul H. Winter

Automatic Feeding Devices

Mechanical Feeding of Parts Substantially Reduces Machining and Assembly Costs on Large Production Runs

THE INCREASING TREND toward mechanization of all operations, machining as well as assembling, has resulted in the tool and machine designer being confronted with numerous problems, not the least of which is to design suitable feeding devices that will present the components to the tools in the proper position and location. Mechanisms that will perform these functions are known as hoppers and can be classified into two main groups, magazine fed and bulk fed hoppers.

In magazine feeding, the pieces to be handled are manually placed in their proper position into a container, known as a magazine, which may either be an integral part of the machine or a fixture—or a detachable piece—that can be manually filled while the machine is in operation and which supplements a second, previously filled magazine. Once the workpieces are thus positioned, they can be mechanically picked up, one or several at a time, and carried into the working position.

Mechanical Sorting

In bulk feeding, it is not required to position each individual piece by hand, since the parts are dumped into a container which mechanically sorts and arranges them in their correct position, and feeds them towards the point from where they can again be picked up and transferred to the working position. Naturally, the additional complication and expense is only justified if the volume is large enough, and some pieces do not even lend themselves to automatic handling of this type. If, however, production runs are sufficiently large, the advantage of a machine that requires only occasional attendance—as to supply another batch of parts—is readily seen.

Many parts are so shaped that they may be stacked and the lowest piece slid from under the pile without taking the next piece with it. If a part of this type is to be magazine fed, so-called slice feeding is frequently used. This method uses a pusher somewhat thinner than the thickness of the piece and in line with the lowest piece in the stack. As the pusher advances, it forces the lowest piece out of the pile, the other parts being prevented from dropping down until the pusher has withdrawn and is ready to feed the next piece.

The principle of operation is readily understood by studying the application of a magazine fed, slice feed hopper to a Brown & Sharpe automatic screw machine used for second operation work where the pieces have to be held in a collet for work on the cut-off end of the first operation. This is usually done on a hand operated turret lathe, but with the attachment shown one operator can tend several machines by merely keeping the magazines filled.

The magazine is mounted on the rear cross slide, as shown in Fig. 1, with the pieces resting on top of each other and the lip at the bottom of the magazine holding the lowest piece. The cut-out in the side is merely wide enough to permit one piece only to slide out sideways. By correctly camming the machine, the rear cross slide moves forward at the beginning of each cycle, bringing the lowest piece in the magazine in line with the open collet.

A solid pusher bar, mounted in one of the turret faces, is then advanced by the turret slide, pushing the lowest piece into the open collet. All other pieces are prevented from dropping down by the pusher bar itself and from moving sideways by the sideplates. After the collet grips the workpiece, the turret withdraws, allowing the next piece to drop into position, while the rear cross slide moves out of the way to clear the work for cutting.

On completion of the cutting cycle, the collet opens and ejection of the finished piece is accomplished by means of a spring—or an airblast—mounted in the hollow machine spindle. The machine will automatically repeat this cycle until the magazine is empty. A switch may be mounted in the magazine, to be held open as long as it is loaded, so that when the last piece is fed the switch closes and a bell or other signal notifies the operator.

Obviously, this method can be used for any workpieces that are thick enough to permit slicing one piece at a time from the bottom of the pile and where a suitable pusher mechanism can be incorporated and cycled with the machine or fixture. It is not necessary that the pusher mechanism reciprocate, as it may be modified to continuously move in the same direction. Machines have been built in which the pieces are taken from the bottom of the pile by fingers attached to a moving chain or rotating table and then carried by these fingers to the work station. If the operation to be performed is such that the work does not have to come to a stop (as in a face grinding operation), the chain or table may have a continuous movement; if, however, the work has to stop, an intermittent drive, as imparted by a Geneva drive or ratchet and pawl, must be incorporated.

Vacuum Pick-Ups

When workpieces are too thin to make the design of a pusher practical, or not sufficiently rigid to resist crumpling when pushed, a slice feed can obviously not be used. Paper sheets and similar parts are therefore usually handled by means of vacuum pick-ups which use air suction produced by a vacuum pump to pick up one sheet at a time. Since this can only be done from the top of the pile, a feeder mechanism must be used that will present each sheet to the pick-up at the same point. A common method is shown in Fig. 2. The stack of sheets is placed on a support table and the suction unit passes over it, picking up the top sheet at each pass.

Before the suction unit returns on its next stroke, the pawl—which is cycled to the machine—turns the nut a fixed amount through a ratchet and gearing. This raises the screw, and with it the support, an amount equal to the thickness of the sheet so that the next piece will be picked up at the same point as the one preceding. If different thicknesses of material are to be handled, the stroke of the pawl can easily be designed to be adjustable to provide for altering the amount of lift per stroke.

In considering a bulk feed hopper it must be borne in mind that the pieces loaded into the hopper will tumble against each other to a certain extent. If the surface finish is

important and must not be damaged, or if the pieces are very fragile, it may not be possible to use a bulk fed hopper. By approaching each problem with an open mind, however, ways and means may be found to overcome difficult jobs.

One of the most common applications for bulk fed hoppers is the feeding of screws and rivets in power screw drivers and rivet setting machines. Screws and rivets lend themselves very readily to hopper feeding, since a simple track (made up of two parallels spaced a little further than the shank diameter of the screws or rivets) will satisfactorily orientate and, if sufficiently inclined, feed the parts.

Commercial Hoppers Recommended

Various methods have been developed to sort screws and rivets for hopper feeding and, while it is usually cheaper to buy a commercially available hopper unit than to design and build it for single installations, we will describe several designs as the principles involved can often be applied to other special similarly shaped parts.

A frequently used design is the dip feeder shown in Fig. 3. The parts to be fed are dumped into a container with sloping sides, in the center of which is a circular segment that rocks about a shaft from a low position, in which the top surface of the segment is horizontal, to a high position in which the top surface slopes sufficiently for the pieces to slide into the fixed slide. When used with screws and rivets, and other parts of the same general outline, both the track incorporated in the rocking member and the fixed track are of the type described in the last paragraph, the parts being supported under the head or large diameter.

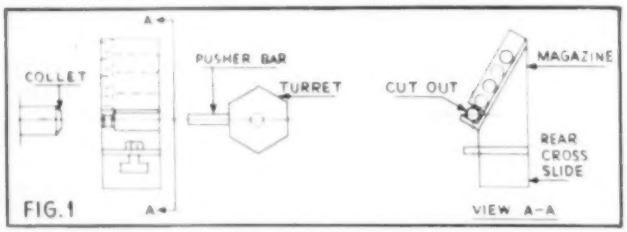


FIG. 1. By mounting a magazine on the cross slide of an automatic screw machine and using a pusher bar in the turret, automatic loading of second operation work is made possible.

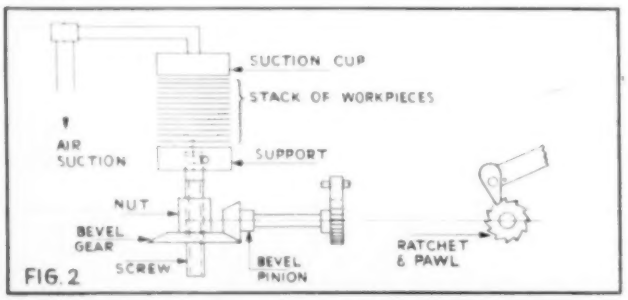


FIG. 2. A suction pick-up lifts up pieces of paper from the pile, which is raised by an amount equal to the paper thickness after every pick-up by means of a ratchet and gearing.

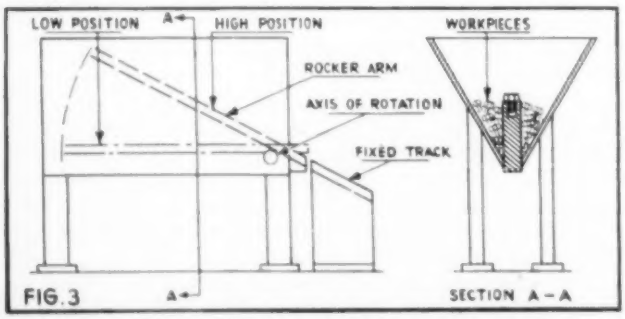


FIG. 3. The rocker arm oscillates in a pile of work parts, picking up a few in each cycle and letting them slide into the fixed track.

The level of parts in the hopper must be maintained above the lowest position and below the highest position of the rocker arm. As the rocker arm approaches its lowest position, gravity will cause some of the pieces in the hopper to tumble into the slot and remain in it when the arm begins its upward movement. At the highest point, these pieces will slide down the track and be caught in the fixed slide from where they can be picked up for further operations.

This principle can be adapted for other types of parts. An interesting example is shown in Fig. 4. It was required to bulk feed the workpieces and dip feeding was considered to be the most suitable. The rocker arm is beveled along one top edge, as shown, so that if the rocker arm picks up the pieces under the short arm on the high side of the bevel, they will stay on the rocker as the center of gravity of the part is directly under the support so that the pieces can slide down in the correct position for further processing. If they are picked up on the opposite side of the rocker, the center of gravity is outside the vertical line of support and they fall back into the container until they are eventually picked up in the correct position.

A very popular design for feeding screws, rivets and similarly shaped parts is shown in Fig. 5. It incorporates an annular rotating disc, which is set up with its axis of rotation at an angle to the horizontal. The disc carries a number of slots in its face which pick up screws that lie at the bottom of the disc and are prevented from falling out by means of a slip-on cover. These picked-up screws rotate with the disc and cannot drop into the center until they pass the guard at the point where each slot in turn lines up with the stationary track, into which they slip from the ring to be delivered by gravity to the work station.

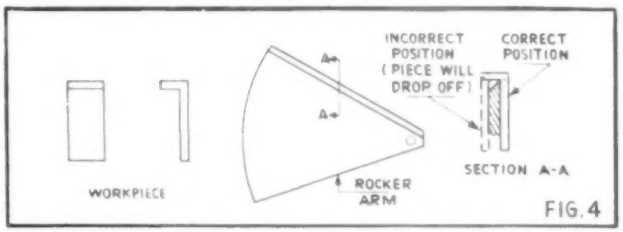


FIG. 4. By suitably beveling the top of the rocker arm of the design shown in Fig. 3, these pieces are picked up in one position only.

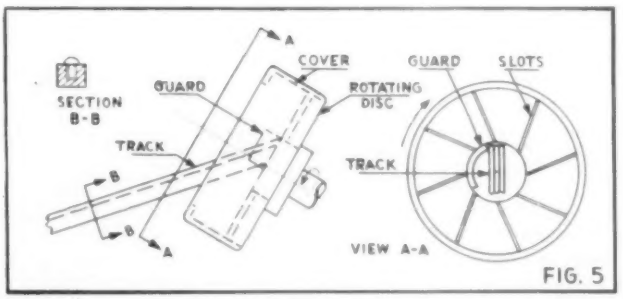


FIG. 5. The slots in the rotating disc pick up the parts and let them slide into a stationary track at the highest point of rotation.

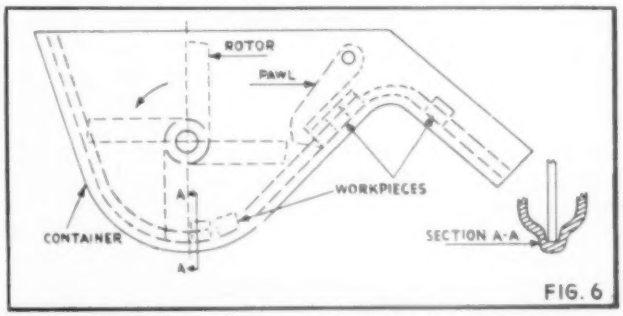


FIG. 6. Rotating blades agitate the parts and slide them along the bottom groove to the top from where they descend by gravity.

When bulk feeding, it is practically always necessary to incorporate in the hopper some means of agitating the pieces to prevent them from sticking and interlocking. A good illustration of this design is shown in Fig. 6, which combines the functions of the agitator and the feeder in one simple rotating part. The pieces fed in this particular application are square nuts that are fed into a tapping station and, since both sides are alike, it is immaterial which face is presented to the tap.

When the nut blanks are dumped into the container, the sloping walls cause some of the blanks to position themselves on edge in the slot at the bottom of the container. A rotor with four blades of the same thickness as the nuts rotates continuously through the blanks, agitating them and simultaneously moving ahead the blanks in the slot.

As the nuts are pushed up along the slot they are prevented from dropping back by the pawl and the continuous flow of nuts; the front ones, being pushed by the ones in back, causes them to slide down the track into the working station. At first glance, it would appear simpler to eliminate the pawl mechanism and merely push the blanks along a downward sloping track instead of lifting them up and then letting them drop; however, the design described prevents a collection of pieces with its ensuing jams.

Selection by Color

The above method is also used for feeding round laminated plastic discs to an automatic assembly machine. Since one side of these discs has been sanded for flatness, which produces a difference in color between the sanded and unsanded sides, this difference is used to insure the delivery of discs with the sanded side up only. After being fed by means of a hopper similar to the one shown in Fig. 6, they drop onto a perforated conveyor belt with either face up as shown in Fig. 7.

The belt carries the workpieces past a light source so that the reflected light enters a color sensitive photo electric relay, set to remain inactive when the reflected color of the sanded side strikes it, but which operates the solenoid valve when the unsanded side passes. The ensuing air blast, thru the perforated conveyor belt, blows the discs in the incorrect position onto another conveyor belt that carries them back to the hopper container whence they are fed until the parts are delivered correct side up.

Special precautions are sometimes required to prevent irregularly shaped pieces from interlocking and jamming at the exit of the hopper. Fig. 8 shows a part that was to be bulk fed for further processing in an automatic assembly machine. Various methods of feeding were considered but, in all of them, there appeared the possibility of having an incorrectly positioned piece block the point of exit. Consequently, a positive method of removing all but correctly positioned parts was devised.

The shape of the part permits it to be properly supported on the two sides of a sloping trough, with the long leg protruding through the opening in the bottom as shown in Fig. 8. The bottom of the trough slopes up to the point of exit, with the lower part of each side formed by one face of a belt moving towards the point of exit. As the pieces are dumped into the container, some at the bottom of the pile drop into the position shown in Fig. 8 and are then transported by the belts to the point of exit.

Other pieces, however, do not drop into the correct position but are picked up by the belts anyway and are then jammed against the point of exit, blocking it entirely. This jam is eliminated by mounting a rotating paddle wheel, provided with rubber blades, near the point of exit. These blades are so shaped that they will not strike properly positioned pieces, but will hit all other parts and throw them back into the other end of the container from where they are fed by the belts until properly positioned.

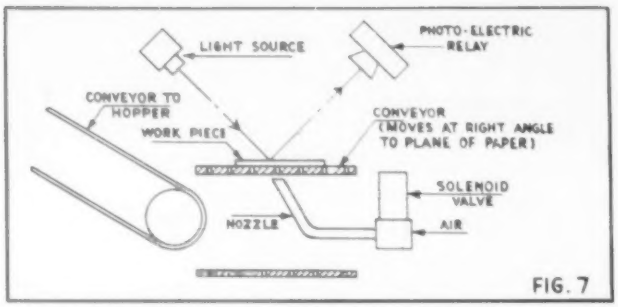


FIG. 7. A photo-electric relay is actuated by the color difference of the two sides of the part to pass or reject the pieces. A second conveyor carries parts to hopper.

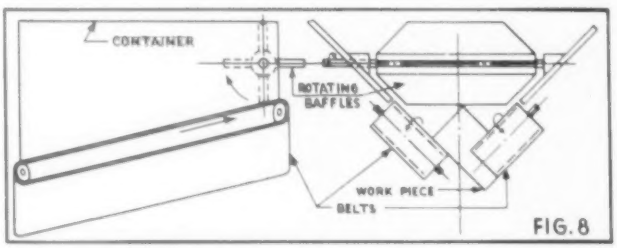


FIG. 8. The rotor blades throw back any workpiece that is not carried in the correct position by the two belts, thus preventing blocking of the point of exit.

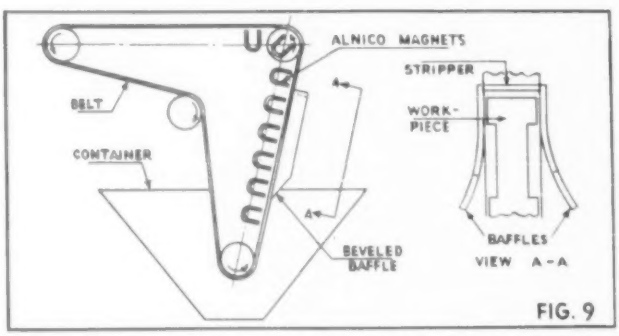


FIG. 9. Permanent magnets attract pieces to the face of the belt, and suitably positioned baffles position them correctly on the belt for further processing.

Pieces made of steel, or other magnetic material, can sometimes be handled more readily by utilizing their magnetic properties than by attempting to perform all functions mechanically. Fig. 9 shows an elongated steel plate that is dumped into a container in which is mounted a rotating belt, sloping as shown. Permanent alnico magnets are mounted behind the belt and exert enough pull to attract the plates from the pile to the face of the belt.

As very little force is required to slide the pieces from one magnet to the other, the belt carries them up the reverse slope, in whatever position they are picked up out of the container, until they come up against the baffles. If the parts are held crosswise on the belt, they ride up on the bevel of the baffles so that the attraction of the magnets is not sufficient and the plates fall back into the container. Tilted parts on the belt are straightened out by the baffles.

Occasionally one part lies on top of another and is then stripped from the belt when passing through a slot just wide enough to pass one plate only. In this manner, only properly positioned plates arrive at the top of the belt, where additional magnets cause the pieces to move onto the horizontal part of the belt which carries them to the work station.

It is not possible to lay down hard and fast rules for the design of feeding devices, since every problem is different and must be considered on its own merits. We have, however, endeavored to show a number of principles and methods that have given satisfaction in actual operation and which may thus serve as starting points for other designs.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Drill Jig for Hex Tube

AN IMPORTANT CONSIDERATION, in drill jig design, is that construction should be as simple as possible. And, it should be "foolproof", so that an operator cannot load the workpiece in wrong position, which results in spoiled work. The time spent in loading and unloading is unproductive and should be kept as low as possible.

The drill jig described in this article is for drilling sixty-six $\frac{3}{16}$" holes in a hexagonal tube (Fig. 1) and has been designed to embrace the important considerations mentioned, viz: simplicity in design and manipulation, and within-tolerance accuracy of the parts produced. The tubes are cut off and disc ground to length; hence, can be loaded from either end.

The jig (Fig. 2) consists of a cast iron angle base, to which a tray-type bushing plate is screwed and dowelled. A hexagon mandrel, ground slip fit for the I.D. of the tube, turns in a bronze bushing (it could be a needle-type roller bearing) and is indexed by turning the clamping nut clockwise, first releasing the locking pawl, shown in view A. While the latter is short, so as not to interfere with the drill, it could be goosenecked, if desired, to run to one side of and parallel with the bushing holes. For the small holes, however, the leverage is adequate as shown.

To load and unload, the knurled hand nut—which is somewhat smaller than the I.D. of the tube—is turned slightly, when the U washer can be slipped on or off and the part slid on and off the mandrel. Naturally, the drilling will throw up burrs on the inside of the tube, which would interfere with unloading; therefore clearance slots (View B-B) are milled into the flats of the hex, these acting both as chip pockets and to facilitate unloading.

Design may possibly be criticized because the long overhang of the mandrel may spring it downward under drill thrust, especially at the far end; however, any errors resulting there-from would be negligible in the case of the short tube shown. For a longer tube, a swing-away support might be provided.

34-67000 *Robert Mawson, Providence, R. I.*

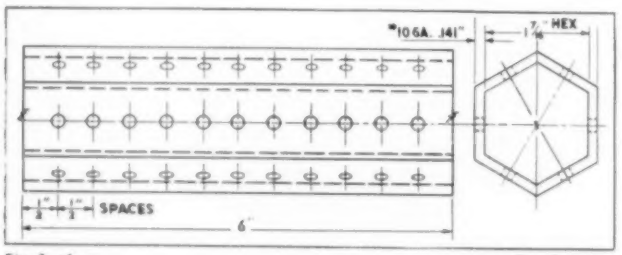
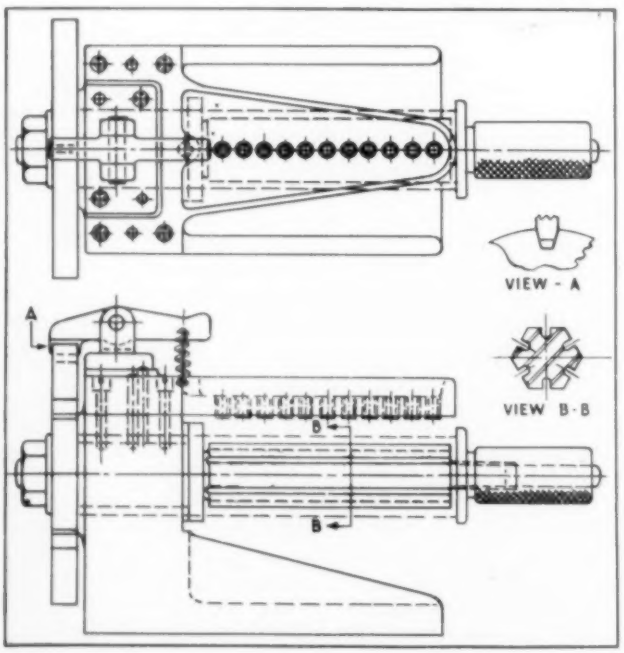


Fig. 1, above.

Fig. 2, below.



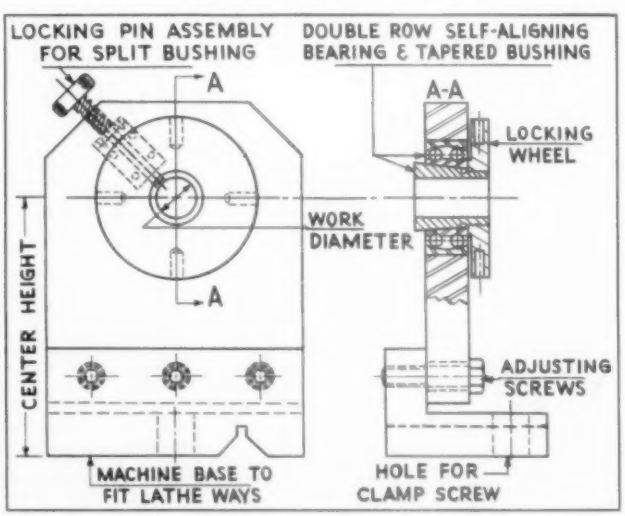
Self-Aligning Back Rest

A SELF-ALIGNING STEADY REST, of the type illustrated, can be an invaluable aid in production turning. It assures concentricity, holds work snugly and therefore reduces chatter, and also prevents the scoring of finished surfaces, which sometimes occurs with conventional 3-point steady rests. It need not necessarily be made like the drawing, which merely conveys the general idea; however, it must be solidly constructed for satisfactory performance.

Aside from the body of the rest, the main parts are the bearing, locking wheel and locking pin assembly. The ball bearing is a self-aligning adapter type, but instead of using the adapter sleeves, split bushings, bored to the O. D. of the work, are used. The locking wheel draws the tapered sleeve tight into the bearing and, because the bushing is split, permits compensation for wear as well as for adjustment to fit slight variations in diameter. The locking pin prevents the bearing from turning when inserting or withdrawing work.

The base has a Vee, to fit the Vee on the lathe bed, and the upright has holes slightly larger than the clamp screws to allow for slight lateral and vertical adjustment. The self-aligning feature allows for possible defection of stock, under which conditions a plain ball bearing would cramp, and also for offset when turning tapers. Naturally, interchangeable bushings may be made to suit different diameters of work.

34-93000 *Edmund L. Johnson, Pittsburgh, Pa.*



by Vaners Borg

31-58110

Compressed Air—The Great Equalizer

Air tools put the small shop on a competitive basis with larger manufacturing plants

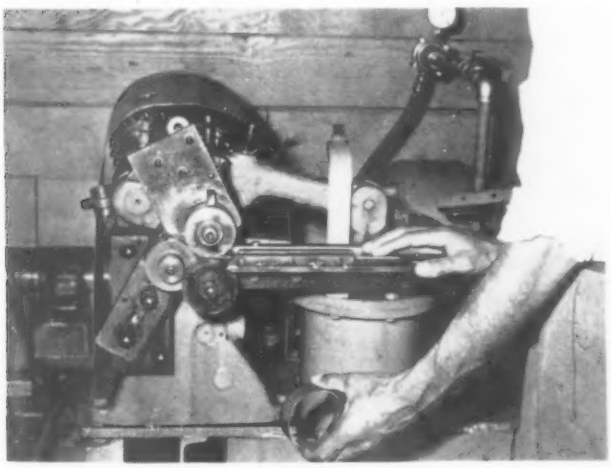
LIKE THE COLT REVOLVER of frontier days, which made the small man the equal of the big, compressed air motors, tools and appliances provide equal manufacturing economies for small as well as large manufacturing plants. The truth of this statement is established in the case of the 100 x 50-foot shop of the Accurate Tool & Engineering Company, San Diego, Cal., which, through the proper application of compressed air to manufacturing processes, finds itself in nowise handicapped in competing with larger plants.

Moving through this San Diego shop may be any production contract from commercial fish hooks to concrete block-making machines weighing five tons, or a development contract on such machines as the one which automatically vends a cup of coffee for a nickel and a penny brings the cream and sugar as desired. Whatever work is in progress, compressed air usually plays an important part in production.

Following the steps in the quantity production of a ring part, for a manifold, shows how compressed air is used to reduce man-hours on the contract. Fig. 1 shows a band roller for rolling strip stainless steel into a ring. Here, an air cylinder provides the power to pull the top roll against the two lower rolls, a pressure of 2000 pounds. It would be impractical for the operator to apply that pressure manually, even were he able. Using any other power than compressed air for the task would involve complicated apparatus, costly to buy and costly to maintain compared to the simplicity and economy in operation of compressed air.

The formed rings are taken to a flash welding machine, where compressed air holds the electrodes to the work, and then to the machine shown in Fig. 2 for trimming the flash. This machine, which was designed by the company for its own use, removes the flash in a fraction of the time ordinarily

Fig. 1, at top. Air cylinder pulls down the top roll of a band roller with 2000 lbs. pressure, against the lower rolls, in the process of rolling metal strip into rings. Fig. 2, below. Trimming welding flash this way is many times faster than grinding or filing. The air cylinder at the right supplies the push to clamp the ring in place during the trimming operation.



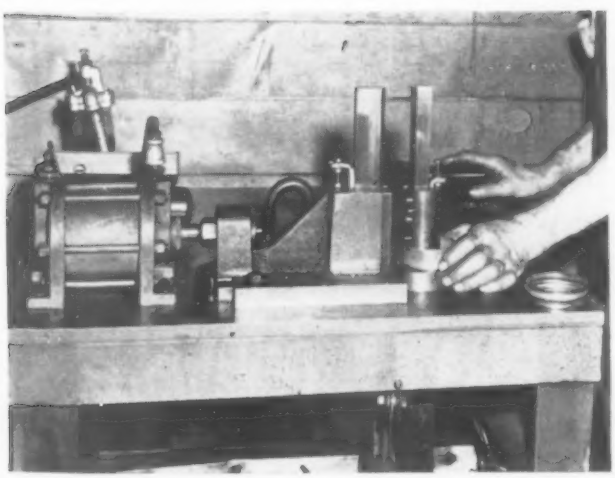
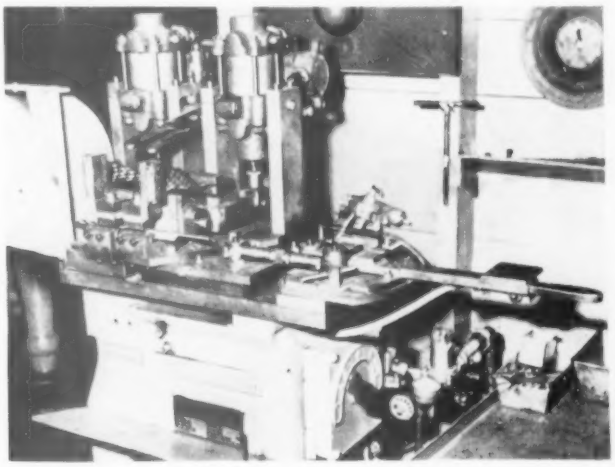
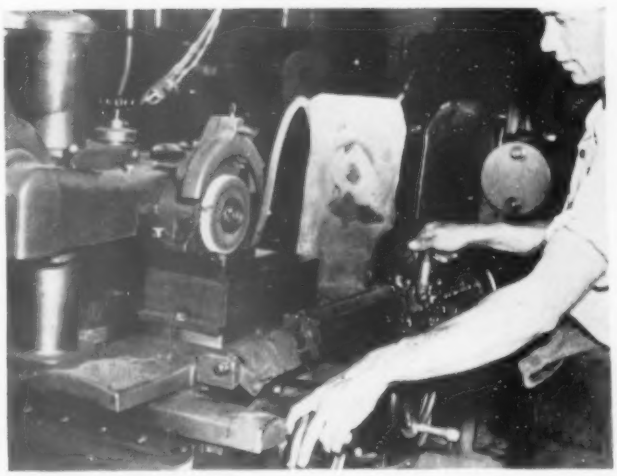


Fig. 3, at top. The two air cylinders at the top of this butt welding machine clamp the workpieces to be welded at the touch of a lever. Fig. 4, at bottom. Compressed air, applied to grinding of flat, straight-edged tools saves time, reduces operator fatigue and improves work. Air motors traverse the grinder table back and forth as the operator hand feeds the workpieces.





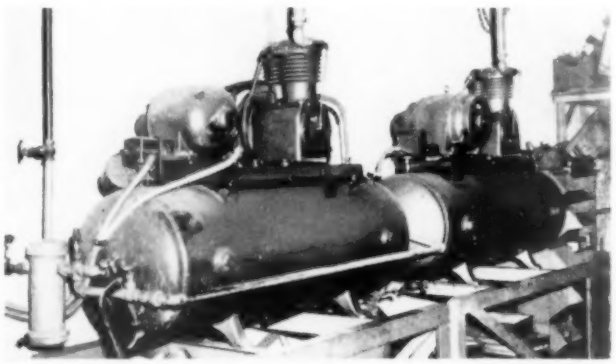
required by grinding or filing. A compressed air-actuated piston, controlled by a solenoid valve, acts to clamp the ring in place while cutters move down to shear both sides at once. A punch press-type dog is used in connection with the wheel which drives the strippers down and back.

The machine for rolling the bead of the ring also was designed in the company's shop and employs compressed air to save production time. During the beading, the part is subjected to mechanical pressure that is close to the breaking point. To tighten the part in the machine for this operation, by manual methods, would require a full minute of the worker's time; however, a tapered air-actuated collet does it in three seconds. The result—three pieces beaded per minute.

The spot welding machines offer another example of compressed air at work in aiding production. First movement of the foot pedal, on these machines, clamps the electrodes together under the pressure of compressed air, and a continued push on the same pedal turns on the current for welding. The butt welding machine, shown in Fig. 3, clamps each piece in place for welding at the touch of buttons. While hand pressure or clamping would be possible for this work, it would not be uniform and the repetitive exertion would result in fatigue and materially slowed-down production. With compressed air, output gains on an all-day job.

Fig. 4 shows how a tool grinder, not originally provided with powertable travel, can be converted into a power traversed surface grinder by resort to an air motor. Thus converted, operator fatigue is reduced and production increased. Table movement is controlled by a valve at the operator's right hand.

Fig. 5. These two, 5-HP, two-stage air compressors, at Accurate Tool & Engineering Co., San Diego, Cal., assure ample capacity for all compressed air requirements. One compressor may be used as a "standby".



The fact that very large manufacturing plants are able to multiply savings many times on each man-hour economy devised, because of their multiple operations, does not overshadow the importance of the economies effected by smaller shops on single machines such as those described. On the contrary, the percentage of saving effected is just as great, and smaller shops that use production short-cuts usually are the ones that prosper.

Standard Equipment Effects Economy

The economies of compressed air are equally available to every size machine shop because air compressor manufacturers produce standard equipment in a wide range of types and sizes to fit individual requirements. The compressors at the Accurate Tool & Engineering shop, for example, are small, two-stage, air-cooled units (Fig. 5) driven by 5 H.P. motors.

As with most machine shops, the San Diego company considers a pressure of around 100 pounds psi, in the lines, most suitable for its purposes, and two-stage compressors usually are best for this pressure range. By having two units, rather than one larger compressor, the company has a standby. As a rule, one compressor supplies sufficient compressed air but, during peak loads, the second unit cuts in to maintain the constant pressure necessary for the most economical operation of pneumatic equipment.

Clinton Davidson, design engineer for the company, laid out the compressed air system, also, the one for another San Diego plant which covers several city blocks. In both cases, considerations of pipe sizes, elimination of moisture, and ample compressor capacity, were similar in some respects.

The main air line of the shop is 2-inch pipe, which is more than ample to hold to the minimum any pressure drop from the receiver to the point of use. Branch lines are of 1-inch pipe and the lines to the machines are ½ and ¾-inch sizes. The receiver tank collects moisture and there is no problem in this respect. Although San Diego climate is noted for its clean air, compressor intake air is filtered.

Provisions to assure clean, dry air at constant pressure enable the San Diego shop to have the full benefits of compressed air which is so conveniently stored and conveyed to the point of use. Then, at the point of use, it performs its allotted tasks, without fuss or further ado, to save valuable production hours.

MATERIAL AND PHOTOS for this article were obtained through the courtesy of Mr. Harry Wright, partner and chief engineer of the Accurate Tool & Engineering Company San Diego, Cal., and the Compressed Air Institute, 1404 Terminal Tower, Cleveland 13, Ohio, which, having completed the compilation of the "Compressed Air Handbook", is now resuming its Industrial Education Program.

The Editors

Private Seminar on Standardization

DR. JOHN GAILLARD, mechanical engineer on the staff of the American Standards Association, and a lecturer on industrial standards at Columbia University, will conduct a five-day private Seminar on Standardization beginning Monday, January 26, 1948. The Seminar, to continue through January 30, will consist of two conferences daily at 9:30 a. m., and will be held in Room 503, Engineering Societies Bld'g, 29 West 39th St., New York City.

The ten subjects, which have been selected for the benefit of companies and individuals having problems concerning the organization of standardization work or the technique of writing standard specifications, are briefly indicated below:

1. Development of various types of technical and managerial standards in human society.
2. Analysis of essential functions of standardization.
3. Definition and basic characteristics of the concept "standard". Nominal values . . . deviations and limits.
4. The general problem of quality control. Definition; inspecting and testing; process control.
5. Dimensional quality control; international basis of interchangeable manufacture . . .
6. Specifications for gaging inspection of cylindrical parts. Influences of tolerances on inspection results.
7. Four levels of industrial standardization—company, trade, national and international.
8. Organization of standardization work in individual manufacturing concerns . . . place in managerial picture . . .
9. Application, simplification, and unification of existing industrial standards, and design of new standards.
10. Principles and technique of formulating standards. Content, form, arrangement and wording of specifications . . .

Those interested in registration may write Dr. Gaillard at his home, 400 West 118th St., New York 27, N. Y. During office hours, he may be reached at American Standards Association headquarters, 70 East 45th St., New York 17—phone Murray Hill 3-3058.

By Adam Gabriel

Proposed Bill on the Units of Length

A simpler relation between the inch and millimeter would alleviate present confusion

RECENTLY THE METRIC COMMITTEE, working under the sponsorship of the American Standards Association, sent out a questionnaire having as its subject whether American industry would favor the adopting of a simpler relation between the inch and the millimeter rather than continue the present relation which, by conversion from one to another, had led (particularly during the war years) to confusion and annoying errors.

The situation, as regards our standards of measurement, may be considerably clarified by an "*Historical Background on National Standards of Measurement*", as compiled June, 1947, by the American Standards Association. This follows in quote:

"Since early colonial days repeated efforts have been made in America to establish national standards of measurement, particularly those concerned with our customary system of weights and measures. Our Constitution delegates to Congress the power to fix such standards. A standard of length, which could if necessary be independently reproduced from physical observations, received frequent consideration and interest from our early Congresses.

"A resolution passed by the Senate in 1836 directed the Secretary of the Treasury to supply the Governors of each state with a set of all weights and measures used by the Treasury Department in the collection of customs. These included an avoirdupois pound of 7000 grains and a yard of 36 inches. No congressional action was taken to legalize these standards, but several states adopted them independently and a groundwork for uniform weights and measures was at last provided.

Adam Gabriel. **Vice President of Acme Industrial Company, Chicago, has made exhaustive study of the science of measurement. Hence, his conclusions may be taken as authoritative. He is a member of Chicago Chapter, A.S.T.E.**

"It was not until after the Civil War, however, that Congress took a formal step to legalize a system of weights and measures, and this oddly enough did not relate to those commonly used, but to the metric system. The act of 1866 made the use of metric units lawful throughout the United States. The meter was defined as equivalent to 39.37 inches, while the millimeter was rounded off to 0.0394 inch—this, in spite of the fact that the length of the inch had never been fixed.

"Thus, we had the anomolous situation in this country of a legalized system of metric weights and measures which was used for scientific purposes, and a customary system which was in common use but had never been legalized. Our government as a participant in the Metric Convention received the platinum-iridium meter bar and kilogram. These, together with the Troy pound constitute the only legal material standards possessed by us. Accordingly, in 1893, the Superintendent of the Coast and Geodetic Survey issued an order to the effect that the Office of Weights and Measures would regard the international prototype meter and kilogram as fundamental standards and the customary units—the yard and the pound—wound be derived therefrom in accordance with the act of July 8, 1866. Thus, 1 inch = 25.40005 (plus) millimeter. In that it was not practical to lay off this incommensurable decimal fraction on a meter bar, we then had a theoretical inch rather than one which could be derived with exactness from the meter bar. Furthermore, our inch was approximately four-millionths longer than the British inch which derived its value directly from the Imperial Yard.

"In the intervening period it has become common practice for engineering purposes both in the United States and Great Britain, as well as in 13 other countries, to use the simpler relation 1 inch = 25.4 millimeters exactly, thus enabling the derivation of the inch from the meter bar. This ratio falls midway between the present accepted values of the British and the United States inch. Reference is also made to the fact that this ratio was recognized as far back as 1933 when the American Standards Association approved the American Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1. This standard has recently been reaffirmed, which indicates that those interests substantially concerned are agreed that this relation is representative of standard practice in industry.

System Without Fixed Standards

"To summarize the situation, the United States for 150 years has been using a customary system of weights and measures without "fixing" the standards on which the system is based. A bill was presented to the last Congress with the simple objective of putting the Government's house in order in this respect. The bill provided that the inch should be fixed in terms of the meter by means of a specified ratio. The ratio proposed for the inch was 1 inch = 0.0254 meter.

"The bill also carried a supplementary definition of the inch in terms of light waves. This was based upon the value adopted some ten years ago by the International Committee on Weights and Measures as the number of wavelengths of the red radiation of cadmium in a meter, a value which is well supported over the years by several independent determinations. This supplemental definition, if adopted, will legalize the direct use of interference methods in the precise determination of the length of gage blocks and similar working standards. The practical value of this procedure cannot be too strongly emphasized.

"The Navy Department, in 1945, formally indicated the desirability of this action to the Department of Commerce, as the Navy was finding more and more need for the use of the metric system in meeting the demands of foreign business and also in connection with the need for metric equivalents in certain classes of specifications and standards. Under such conditions legalized conversion ratios would be extremely helpful. The Department of Commerce, very receptive to this proposal, prepared a bill including the

simpler ratios and the basic unit of length. It, as usual, has been referred to the Director of the Bureau of the Budget, who now desires an indication from American industry as to the desirability of the action. The American Standards Association is, therefore, circulating the enclosed questionnaire, together with this short historical background, in an effort to ascertain industry's viewpoint on this very important question. This legalization of both the English and metric systems would permit the use of either to the extent that it would be of advantage to do so, either in national or international relations."

For Standardized Conversion

Being intensely interested in the subject, the writer secured a copy of a draft of "A Bill", prepared last year (1946) by the National Bureau of Standards, and proposing a standardized metric inch conversion as now almost universally used in industry. It should be understood, however, that this bill—the content of which appears below—has not, as yet, been formally submitted to the Department of Commerce or to the Bureau of the Budget.

"A Bill (Draft prepared September, 1946)

"To define certain units and to fix the standards of weights and measures of the United States.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

"That from and after the passage of this Act the legal definitions of certain units of weight and measure in the United States of America shall be those given in the following sections.

"Sec. 2. The United States inch shall be a legal unit of length defined as equal to thirty-nine thousand four hundred fifty and three hundred sixty-nine thousandths (39450.369) wavelengths of the red radiation from cadmium, measured under standard conditions as specified by the International Committee on Weights and Measures.

"Sec. 3. The meter adopted by Congress July 28, 1866, (15 USC 204; R.S. 3569) as a legal unit of length is further defined as equivalent to one million five hundred fifty-three thousand, one hundred sixty-four and thirteen one-hundreths (1,553,164.13) wave-lengths of the red radiation from cadmium.

"Sec. 4. For purposes of conversion, twenty-five and four-tenths (25.4) millimeters shall be equivalent to one inch, exactly, provided that in geodetic and land surveys one meter shall be taken as equivalent to thirty-nine and thirty-seven hundredths (39.37) inches."

Because of the wide use of the 25.4 standard of conversion, which is the simplest so far used, it naturally follows that no industry would suffer by the adoption of the bill; furthermore, it is evident that the scientific aspect of future development can be greatly helped by its adoption. On these provisions, this paper is respectfully submitted for publication in The Tool Engineer, official publication of the American Society of Tool Engineers, and the writer, as Industry member of the American Standards Association, advocates the submittance of the Bill for action by Congress.

By the provision of this bill, if adopted, the following would become the legal standard:

1. 1 inch = 39,450.369 red λ from cadmium vapor.
2. 1 meter = 1,553,164.13 red λ from cadmium vapor.
3. For conversion, 25.4 millimeters would equal 1 inch exactly.

The present relation, as fixed by an act of Congress July 20, 1886, is 1 yard/1 meter = 3,600/3,937 exact. Thus, the conversion factors should be:

1 yard/1 meter = 3,600/3,937 = .9144018 meters.
1 inch = 1,000/39.37 = 25.40005 (plus) millimeters.
1 millimeter = 39.37/1,000 = .03937 inches.

Due to suspected instability of the prototype meter, Professor A. A. Michelson, of the University of Chicago, in 1892 undertook to establish the linear length of the meter in terms of wave length of light. He found the red radiation from incandescent cadmium most suitable to the purpose and established that the meter contained one million, five hundred fifty-three thousand, one hundred sixty-three and fifty hundredths (1,553,163.50) red light waves from cadmium vapor.

In 1906, this finding was rechecked and, when reduced to standard conditions used by Fabry, Perot, and Benoit (which conditions for some unknown reason were not considered by A. A. Michelson) the results were one million, five hundred fifty-three thousand, one hundred sixty-four and ten hundredths (1,553,164.10) light waves against one million, five hundred fifty-three thousand, one hundred sixty-four and thirteen hundredths (1,553,164.13) light waves by their own methods. Additional rechecking in other parts of the world by other scientists substantiate the figure of 1,553,164.13 as probably correct to within an error of one part in ten million.

The conversion factors of .91440183, 25.40005 and .03937, respectively, because of commercial experience—and, perhaps, insufficient accuracy requirements—became abbreviated to .9144, 25.4, and .0394, and from the tone of a scientific paper of the Bureau of Standards (No. 535, by H. W. Bearce, Senior Physicist of the Bureau of Standards, issued in 1926) it may be inferred that the abbreviated conversion factors caused sufficient annoying differences to warrant the writing of his paper in which he advocates the adoption of a simpler relation. This simpler relation is the subject of the Bill to be introduced for congressional action at this time. In this paper he writes:

"The industry would not suffer by the adoption of the relation of 1 inch equals 25.4 m/m exact, because (1) by common sense use most screw cutting lathes have a 127 or a 254 toothed gear in their train of gears which makes it possible to cut metric thread on lathes having a lead screw of an integral number of threads per inch and vice versa; the relation between feet and meters and yard and meter would be simplified as 1 foot = 12 x 25.4 = 304.8 m/m = 0.3048 meters and 1 yard = 36 x 25.4 = 914.4 m/m = 0.9144 meters".

Also in conversions to wave length of light, the present abbreviated factors result in incorrect integers of wave length of light unless sixth or seventh place decimal digits are used in the calculation, whereas the adoption of the relation as proposed by the Bill to be presented to Congress would bring the end result of conversion of any subdivision of the meter correct to within a hundredth of one wave length of light, even when discarding or approximating the decimals beyond the third digit. Thus, if

1 meter = ... 1,553,164.13 RλC. Vap.
Then:

$$1\ \text{m/m} = \frac{1\ \text{meter}}{1{,}000\ \text{m/m}} = \frac{1{,}553{,}164.13}{1{,}000} = 1{,}553.1641\ ''$$

1 inch = 1m/m × 25.4 = 1,553.164
× 25.4 = ... 39,450.3689 ''
1 foot = 1 inch × 12 = 39,450.369
× 12 = ... 473,404.428 ''
1 yard = 1 inch × 36 = 39,450.369
× 36 = ... 1,420,213.284 ''
1 yard = 0.9144 meter = 1,553,164.13
× .9144 = ... 1,420,213.28 ''
1 foot = 0.3048 meter = 1,553,164.13
× .3048 = ... 473,404.4268 ''
1 inch = 0.0254 meter = 1,553,164.13
× .0254 = ... 39,450.3689 ''

The present relation in the U.S.A. is: 1 yard/1 meter = 3,600/3,937

In Great Britain: 1 yard/1 meter = 3,600/3,937.0113

From these relations the U.S.A. inch is 25.40005 (plus) m/m approximately and the British inch is 25.39998 m/m approximately.

While the difference between the American and British inch is only .00007 m/m (.000002758 inches), too small to be of importance for ordinary transactions, yet 5/7th of the difference is with the U.S.A. inch and greater uniformity may be attained between Britain and the U.S.A. with the 1 inch = 25.4 m/m exact.

If the Bill to be presented is adopted by Congress, one meter would contain 1,000/25.4 = 39.37007874 inches for all transactions of Commerce, except for geodetic and land surveys, for which one meter would continue to contain 1,000/25.40005 = 39.37 inches exact.

Measurements by light waves has steadily progressed since 1906 and has evolved itself from a purely scientific technique to where, at present, many operations are commercially and quickly checked to millionths parts of an inch accuracies.*

*A booklet entitled "Shop Measurements with Light Waves to Millionths of an Inch" will be sent to anyone writing for it by the Acme Scientific Company, 1450 West Randolph Street, Chicago 7, Illinois.

By Anders Jansson

34-71000

A "New" for Production Surface Hardening

DISPROVING THE OLD SAW that "there's nothing new under the sun" since it is claimed to be the only one of its kind, a new development in flame hardening, by Cincinnati Milling and Grinding Machines, Inc., employs flames for surface hardening of parts in production quantities.

Named the "Flamatic", the machine incorporates many new improvements in flame hardening techniques, especially in holding parts within dimensional tolerances and to metallurgical specifications said to be hitherto impractical with the flame method. An important feature is the electronic temperature control system, which permits rapid heating of parts to desired preset temperature, followed by an oil bath. It is claimed that, at instant of quench, the part is held plus or minus 5°F. of the desired value in the critical transformation range.

The machine, which is equipped with standard flame heads, is unusually adaptable and especially applicable to the hardening of gears, pinions, shafts, barrel type cams and other parts that may be rotated. The average range of part sizes includes shafts up to 18" long, and parts with diameters up to 8"; however, larger parts may be accommodated through use of special flame heads and fixtures.

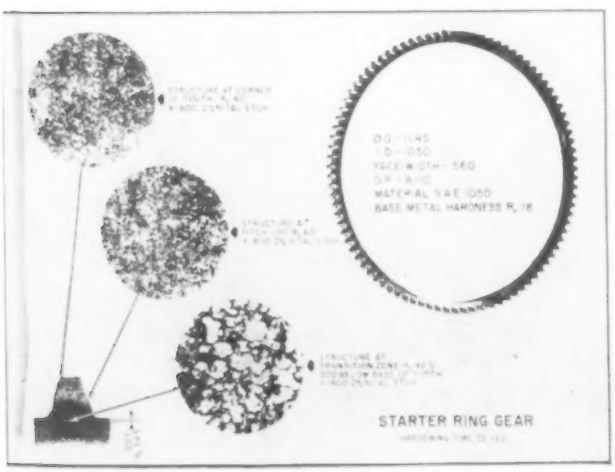
That the machine will perform as claimed was made evident at the recent Metals Show, in Chicago, where, in continuous operation for hardening automotive starter ring gears at the rate of 250 per hour, it attracted unusual attention. Rapid heating, which confines the heat to the surface, leaving the core relatively cool, permits core properties to be established by previous heat treat. Combined with uniform heat penetration and oil quench, this factor results in negligible distortion.

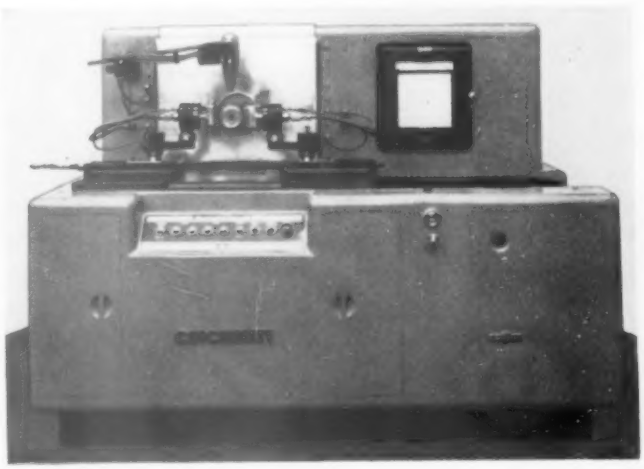
The machine consists essentially of a work table over a conveyorized quench tank, flame head assemblies adjustably mounted on the work table, and a spindle, centered between the flame heads, to which a work holding fixture is attached. The conveyor, which moves a preset distance at the beginning of each cycle, clears a space to receive each workpiece and insures against damage to parts while in the quench. The conveyor also delivers processed parts to a take-off plate at the end of the machine, where they may be collected or picked up by another conveyor, as desired.

Except for loading of parts, the machine is fully automatic. The operator loads the parts on the fixture and presses the automatic cycle start button; from then on, the cycle is completed without further attention. The spindle starts to rotate, and the flames are ignited; then, at the exact moment that the part is heated to the present temperature, the flame is extinguished, the spindle stops rotating and retracts, and the work is stripped from the fixture and quenched.

Outside of the loading, there is practically no manual handling and, since all push buttons and signals are conveniently located in a control panel at the front of the machine and afford full control of the machine at all times, high-production can be maintained with a minimum of operator fatigue.

At left, starter ring gears, surface hardened at the rate of 250 per hour, with microphotographs showing teeth structure at various points. At right, the Flamatic, developed by Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio, for high production surface hardening. The machine which fills a unique place among the Tools of Today, is 7'-8½" wide, 5'-5" deep and 5'-6" high, weighs 8500 pounds ready for operation.





Directory of A.S.T.E. Chapter Chairmen

AKRON, NO. 47
Second Thursday *
Herman A. Guy, *Chairman*
R. D. No. 1, Alliance, Ohio

ATLANTA, NO. 61
Third Monday *
Dwight L. Hollowell, *Chairman*
3174 Peachtree Dr., N. E.,
Atlanta 5, Ga.

BALTIMORE, NO. 13
First Wednesday *
Thomas F. Burke, *Chairman*
2802 Kennedy Ave.,
Baltimore 18, Md.

BINGHAMTON, NO. 35
1st Wed. after 1st Mon. *
Roland B. Andrews, *Chairman*
461 Vestal Road, R. D. 2,
Binghamton, N. Y.

BOSTON, NO. 33
Second Thursday *
John Ryneska, *Chairman*
Western Ave. 69-A,
E. Lynn, Mass.

BUFFALO-NIAGARA FRONTIER, NO. 10
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127 Columbia Drive,
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Third Wednesday *
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2011 D Ave., N. E.,
Cedar Rapids, Iowa

CENTRAL PENNSYLVANIA, NO. 22
Second Tuesday *
Paul P. Stock, *Chairman*
460 Edgehill Rd., York, Penn.

CHICAGO, NO. 5
First Monday *
Fred J. Schmitt, *Chairman*
2727 So. Troy St.,
Chicago 23, Ill.

CINCINNATI, NO. 21
Second Tuesday *
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R.R. No. 1, Box 143-K,
Cincinnati 27, Ohio

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Second Friday *
Edgar W. Baumgardner, *Chairman*
13825 Triskett Road,
Cleveland 11, Ohio

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323 Southwood Ave.,
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DECATUR, NO. 58
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1136 E. Grand Ave.,
Decatur, Ill.

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First Wednesday *
B. J. Hazewinkel, *Chairman*
2355 Jasmine St.,
Denver 7, Colo.

DETROIT, NO. 1
Second Thursday *
Leslie B. Bellamy, *Chairman*
220 E. Milwaukee Ave.,
Detroit 2, Mich.

ELMIRA, NO. 24
First Monday *
Edward Stachel, *Chairman*
927 Spruce St., Elmira, N. Y.

ERIE, NO. 62
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Mathew H. Hetzel, *Chairman*
1140 West 31st St., Erie, Pa.

EVANSVILLE, NO. 73
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R.R. No. 5, Box 30,
Evansville, Ind.

FAIRFIELD CTY., NO. 6
First Wednesday *
Arthur R. Hunt, *Chairman*
64 Avon St., Devon 2, Conn.

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Third Thursday *
Norman F. Snyder, *Chairman*
2006 Mt. Elliott, Flint 4, Mich.

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Second Friday *
William E. Rutz, *Chairman*
142 Dott St., Fond du Lac, Wis.

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914 W. Sherwood Terrace,
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17 S. Island Ave.,
Box 329, Aurora, Ill.

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Third Wednesday *
Floyd V. Snodgrass, *Chairman*
2601 Maxwell Ave.,
Oakland 2, Calif.

HAMILTON, NO. 42
Second Friday *
William A. Alexander, *Chairman*
88 Prospect St. S.,
Hamilton, Ont.

HARTFORD, NO. 7
First Monday *
Richard A. Smith, *Chairman*
28 Harvard St.,
Hartford 6, Conn.

HOUSTON, NO. 29
Second Tuesday *
Homer Briggs, *Chairman*
6514 Pinehurst,
Houston 3, Texas

INDIANAPOLIS, NO. 37
First Thursday *
John Horton, *Chairman*
816 N. Audubon Road,
Indianapolis 1, Ind.

KANSAS CITY, NO. 57
First Wednesday *
Leroy E. Campbell, *Chairman*
5912 College Ave.,
Kansas City 4, Mo.

LITTLE RHODY, NO. 53
Third Wednesday *
Wilfred J. Pender, *Chairman*
43 Seba Kent Road,
Pawtucket, R. I.

LOS ANGELES, NO. 27
Second Thursday *
Leslie F. Hawes, *Chairman*
412 N. LaBrea,
Inglewood, Calif.

LOUISVILLE, NO. 54
Second Tuesday *
John E. Paskey, *Chairman*
2322 Greenwood Ave.,
Louisville 11, Ky.

MADISON, NO. 75
1st Tues. after 1st Mon. *
Fred H. Kessenich, *Chairman*
308 E. Wilson St.,
Madison 3, Wis.

MID-HUDSON, NO. 74
Second Tuesday *
John L. Petz, *Chairman*
Pendell Road,
Poughkeepsie, N. Y.

MILWAUKEE, NO. 4
Second Thursday *
Paul E. Butzin, *Chairman*
8104 Richmond Court,
Wauwatosa 13, Wis.

MONTREAL, NO. 50
Second Wednesday *
Henry T. Welch, *Chairman*
732 Victoria Ave.,
St. Lambert, Que.

MUNCIE, NO. 70
Second Wednesday *
Robert L. Waters, *Chairman*
811 March St., Muncie, Ind.

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Third Friday *
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1513 Ashwood Ave.
Nashville 4, Tenn.

NEW HAVEN, NO. 41
Second Thursday *
Ray E. Gifford, *Chairman*
96 Kimberly Ave.,
East Haven 12, Conn.

NEW ORLEANS, NO. 60
Second Wednesday *
Carl Hazlewood, *Chairman*
6574 General Haig
New Orleans 19, La.

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325 Cherry St.,
Douglaston Manor, L.I., N.Y.

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94 Dunlop Drive,
St. Catharines, Ont.

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2nd Friday *
Theodore A. Hersh, *Chairman*
2901 Westridge Ave.
Ft. Worth 7, Texas

NORTHERN NEW JERSEY, NO. 14
Second Tuesday *
Charles Carlson, *Chairman*
Thomas A. Edison, Inc.
Orange, N. J.

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First Tuesday *
R. C. Kolb, *Chairman*
98 N. Maplewood Ave.,
Peoria 5, Ill.

PHILADELPHIA, NO. 15
Third Thursday *
Arthur R. Diamond, *Chairman*
Greene Manor,
Johnson and Greene Sts.,
Philadelphia 44, Pa.

PHOENIX, NO. 67
Third Wednesday *
Harry E. Rives, *Chairman*
Rt. No. 1, Box 43-D
Tempe, Arizona

PITTSBURGH, NO. 8
First Friday *
Paul H. Magnus, *Chairman*
Tranter Mfg. Co.,
105 Water St.,
Pittsburgh 22, Pa.

PONTIAC, NO. 69
Third Thursday *
Albert J. Rhodes, *Chairman*
1245 Rhodes Rd.,
Lake Orion, Mich.

PORTLAND (MAINE), NO. 46
Fourth Friday *
Carl L. Bohlin, *Chairman*
28 Hall Ave., Saco, Maine

PORTLAND (OREGON), NO. 63
Third Thursday *
William E. Brennan, *Chairman*
3036 S.E. 33rd Ave.,
Portland 2, Ore.

POTOMAC, NO. 48
First Thursday *
Richard P. Thayer, *Chairman*
4704 Butterworth Pl., N.W.
Washington 16, D. C.

RACINE, NO. 2
First Monday *
William P. Clark, *Chairman*
2105 Washington Ave.,
Racine, Wis.

RICHMOND, NO. 66
Second Tuesday *
Lowell B. Penland, *Chairman*
2509 E. Main St.,
Richmond, Ind.

ROCHESTER, NO. 16
First Monday *
Milton L. Roessel, *Chairman*
97 Biltmore Drive
Rochester 12, N. Y.

ROCKFORD, NO. 12
First Thursday *
Earneat Y. Seborg, *Chairman*
1523 Huffman Blvd.,
Rockford, Ill.

ST. LOUIS, NO. 17
First Thursday *
Edward H. Ruder, *Chairman*
57 Hanley Downs,
Richmond Heights 17, Mo.

SAN DIEGO, NO. 44
Second Tuesday *
Raymond W. Peters, *Chairman*
6952 Fitch Ct.
San Diego 11, Calif.

SCHENECTADY, NO. 20
Second Thursday *
John Stedman, *Chairman*
54 Broderick St.
Albany 5, N. Y.

SEATTLE, NO. 39
Second Tuesday *
Gordon Munro, *Chairman*
Rt. 4, Box 2432
Bremerton, Wash.

SOUTH BEND, NO. 30
Second Tuesday *
Edgar W. Helm, *Chairman*
1152 E. Victoria St.,
South Bend 14, Ind.

SPRINGFIELD (ILLINOIS), NO. 64
First Tuesday *
Henry G. Becker, *Chairman*
830 No. 5th St.,
Springfield, Ill.

SPRINGFIELD (MASS.), NO. 32
Second Monday *
Alexander W. Todd, *Chairman*
50 Johnson St.,
Springfield 8, Mass.

SPRINGFIELD (OHIO), NO. 76
First Monday *
James B. Douglas, *Chairman*
609 E. McCreight,
Springfield, Ohio

SYRACUSE, NO. 19
Second Tuesday *
Hugo C. Klix, *Chairman*
425 Glenwood Ave.,
Syracuse 7, N. Y.

TOLEDO, NO. 9
Second Wednesday *
Albert Hage, *Chairman*
3700 Roanoke Rd.,
Toledo 12, Ohio

TORONTO, NO. 26
First Wednesday *
L. M. Jardine, *Chairman*
6 Pepler Ave., Toronto, Ont.

TRI CITIES, NO. 23
First Wednesday*
Lennart N. Dahlen, *Chairman*
901 43rd St.
Rock Island, Ill.

TWIN CITIES, NO. 11
Second Tuesday*
Clifford V. Lofdahl, *Chairman*
5933 Elliott Ave. S.,
Minneapolis 7, Minn.

TWIN STATES, NO. 40
Second Wednesday *
Alan E. Stubbs, *Chairman*
Highland Rd., Springfield, Vt.

WESTERN MICHIGAN, NO. 38
Second Monday *
Peter C. Maghielse, *Chairman*
2434 Miller Ave., N. W.
Grand Rapids 4, Mich.

WICHITA, NO. 52
Second Wednesday *
Harold J. Bales, *Chairman*
1702 N. Lorraine Ave.,
Wichita 6, Kan.

WILLIAMSPORT, NO. 49
Second Monday *
Lewis H. Bardo, *Chairman*
2347 Hillside Ave.,
Williamsport, Penn.

WINDSOR, NO. 55
Second Monday *
R. T. Richards, *Chairman*
R.R. No. 1, Windsor, Ont.

WORCESTER, NO. 25
First Tuesday *
Charles W. Monigle, *Chairman*
364 Greenwood St., R.F.D. 2,
Millbury, Mass.

* CHAPTER MEETING NIGHT

Society Prepares for Largest Industrial Show

16th Annual Convention to Run Concurrently with Cleveland Exposition

ONLY ONE of its kind in the world," the Tool Engineer's Industrial Exposition, scheduled for Cleveland, Ohio, March 15-19, gives every indication of being the largest in the Society's history, W. B. Peirce, ASTE President, has announced. With more than 65% of the available exhibit space in Cleveland Public Auditorium already contracted for at press time by some 200 companies, Mr. Peirce's prediction is well on the way to fulfillment.

And a record attendance of industrial visitors from all over the United States, Canada and other lands is anticipated for the immense display of production equipment.

Must Step Up Production

"They will meet," said Mr. Peirce, "to exchange knowledge of new tools and processes. These men of mass production will view the Exposition with special interest this year because we are confronted more than ever before with the problem of turning out more goods at lower prices to combat inflation.

"Tool engineers are faced with an even more serious challenge than they met in wartime. Production must be increased quickly and economically as a factor in saving the peace for which we paid so dearly.

"Now, instead of producing primarily for ourselves, we must supply goods to most of the world. This puts an extra tax on our production facilities."

Like the 1946 Exposition in Cleveland, the March show will be limited to industrial attendance with admission by invitation, for utmost benefit both to visitors and exhibitors. Exposition hours will be from 9:00 A.M. to 6:00 P.M.

With 2000 hotel rooms allocated to ASTE guests, C. V. Briner, Chairman of the Exposition and a Director and Past President of the Society, plans to stagger reservations to accommodate the maximum number of guests, retaining the designated number of rooms throughout the Exposition week. Applications for rooms will be screened at the Central Office in Detroit to assure priority for exhibitors and ASTE members.

Hotel reservations will be released, according to Mr. Briner, if not claimed by 6:00 P.M. on the stated day of arrival, unless accompanied by a deposit covering the first day's occupancy. Such deposits are to be sent directly to the hotel concerned after confirmation of the reservation is received.

Reservation forms are being mailed to the entire membership and should be acted upon at once to avoid disappointment.

Evening Technical Sessions

Registration also will be handled by the Society's headquarters staff, using a simplified duplicate form filled out in advance. Registration fee will be $1.00 for all visitors and includes admission to the technical sessions and plant tours scheduled on the concurrent Annual Meeting Program.

To give adequate time for viewing the Exposition, the technical program of the Cleveland convention will be limited to three evening sessions, Monday, Tuesday and Wednesday. The first two will be devoted to Work Handling and Processing, and Problems in Die Design, respectively.

A novel presentation is planned for the final session when a group of nationally recognized engineers, largely members, serving as a board of experts on a "Tool Engineers Quiz," will answer technical questions propounded by the Society membership.

The National Program Committee, headed by Robert W. Ford, will select the 25 best problems submitted by ASTE members on or before March 1.

"Handbook" Awards for Winners

Sponsors of the winning questions will receive a certificate entitling them to a free copy of the "Tool Engineers' Handbook," as well as a personal certificate of appreciation. Details of this contest are announced on a subsequent page.

Cooperation of the membership in contributing to the success of this feature will determine its inclusion as an annual event at national meetings, Mr. Ford indicates. Through this means it is hoped to serve the membership in the solution of their individual technical problems.

Local physical arrangements for the convention are being handled by a Host Chapter Committee headed by E. W. Baumgardner, Cleveland Chapter Chairman and First Vice-Chairman of the National Program Committee.

On Mr. Baumgardner's staff are: H. B. Osborn, Jr., First Vice-Chairman of Cleveland Chapter and National Public Relations Chairman, who will act as Assistant General Chairman in charge of technical sessions; Glenn A. Hier, Plant Tours; Robert C. Southwell, Transportation; Andrew B. Clark, Technical Arrangements.

Carroll W. Buxton, Signs; Edward W. Harry, Public Relations; John R. Fitzsimmons, Entertainment; Ralph M. Whitaker, Banquet; George F. Pierce, Reception, with Charles W. Scheihing, Co-Chairman; Andrew Cirbus, Tickets; and Harold E. Peiffer, Emergency.

Scheduled tours of some 20 plants in

Visitors to the 1948 Tool Engineer's Industrial Exposition at Cleveland will profit by interchanging ideas, studying comprehensive exhibits of tools, and watching demonstrations of machines and processes as did these members and guests attending the previous show

the Cleveland area, arranged by the local committee, will give Exposition and convention registrants opportunity to observe actual applications of equipment displayed at the show.

No ladies' program or attendance is anticipated, as all available housing accommodations will be needed for the industry.

Companies listed at press time as Exposition exhibitors are: Black Drill Co., Henry P. Boggis & Co., Huebner Publications—*Tool & Die Journal*, Jergens Tool Specialty Co., The Martindale Electric Co., The Motch & Merryweather Machinery Co., National Tool Co., The Ohio Gear Co., Penton Publishing Co., The Pipe Machinery Co., The Rotor Tool Co.

The Stites Tool Co., Strong, Carlisle & Hammond Co., The Technical Publishing Co.—*Die Castings*, The Wardwell Mfg. Co., The Weldon Tool Co. and Zagar Tool, Inc., all of Cleveland, Ohio.

Ampco Metal, Inc., Delta Mfg. Div., Rockwell Mfg. Co.; Reltool Corp., and Stokerunit Corp., Milwaukee; Giddings & Lewis Machine Tool Co., Fond du Lac; Grob Bros., Grafton; Hamilton Mfg. Co., Two Rivers; The Dumore Co., Industrial Enterprises, Inc., National Machine Tool Co., Precise Products Co., and Racine Tool & Machine Co., Racine, Wis.

* * *

Alpha Tool Works, W. O. Barnes Co., Inc., Carboloy Co., Inc., Detroit Power Screwdriver Co., Detroit Reamer & Tool Co., Detroit Stamping Co., Detroit Universal Duplicator Co., Eclipse Counterbore Co., Ex-Cell-O Corp., The Gairing Tool Co., Govro-Nelson Co., Locke Gage Co., Midwest Tool & Mfg. Co., Muller Engineering Co.

National Broach & Machine Co., Perfex Gage & Tool Co., Pioneer Pump & Mfg. Co., The Producto Machine Co., Q. C. Engineering Products, Div. of Pearson, Inc.; Republic Gage Co., Snyder Tool and Engineering Co., Super Tool Co., Swartz Tool Products Co., Swedish Gage Co., Visitrol Corp., The Wickman Corp., Willey's Carbide Tool Co., and N. A. Woodworth Co., of Detroit.

American Chain & Cable Co., Inc., Bridgeport Machines, Inc., and Moore Special Tool Co., Inc., Bridgeport; The Gammons-Hoaglund Co., Manchester; The Charles L. Jarvis Co., Middletown; The Cushman Chuck Co., Hartford; Kellerflex and Pratt & Whitney, Div. Niles-Bement-Pond Co., W. Hartford; The Heim Co., Fairfield; The O. K. Tool Co., Inc., Shelton; F. E. Anderson Oil Co., Portland; and The Whiton Machine Co., New London, Conn.

* * *

Acme Steel Co., Boyar-Schultz Corp., Charles Bruning Co., Inc., Canedy-Otto Mfg. Co., Columbia Tool Steel Co., Commander Mfg. Co., Eugene Dietzgen Co., Chicago Div.; Everede Tool Co., Hanna Engineering Works, Hannifin Corp., R. G. Haskins Co., Hitchcock Publishing Co., Independent Pneumatic Tool Co.

Miller Motor Co., Porst Bros. Mfg. Co., The Frederick Post Co., H. B. Rouse & Co., Scully-Jones & Co., Service Machine Co., Sheldon Machine Co., Inc., Size Control Co., D. A. Stuart Oil Co., and Vascoloy-Ramet Corp., Chicago, Ill.

Bendix-Westinghouse Automobile Air Brake Co., Elyria; Buckeye Tools Corp., The Sheffield Corp., The Vulcan Tool Co., and Delco Products Div., G. M. C., Dayton; The Steel Products Engineering Co., Springfield; C. B. Hunt & Son, Inc., Salem; Manufacturers Engineering Service, Inc., Toledo; and The Denison Engineering Co., Columbus, Ohio.

Austenal Laboratories, Inc., Chicago Pneumatic Tool Co., Conover-Mast Co. —*Mill & Factory;* Cosa Corp., Eutectic Welding Alloys Corp., Haynes Stellite Co., The Industrial Press, Ingersoll Rand Co., *The Iron Age*, A. Milne & Co., Nichols-Morris Corp., Shell Oil Co., Inc., and Socony-Vacuum Oil Co., Inc., New York City.

Arthur A. Crafts Co., Inc., Boston; B. C. Ames Co., Waltham; Bay State Abrasive Products Co., Westboro: Norton Co., Worcester; Threadwell T[illegible] & Die Co., Subs. Sheffield Corp., G[illegible]-field; Simonds Saw & Steel Co., F[illegible]-burg; Edward Blake Co., Ne[illegible]n Centre; Morse Twist Drill & Ma[illegible]e Co., New Bedford; and The L. S. S[illegible]-rett Co., Athol, Mass.

Allegheny Ludlum Steel Corp., [illegible]d Firth-Sterling Steel & Carbide C[illegible]., Pittsburgh; A. P. deSanno & Son, [illegible]c., Phoenixville; Simonds Abrasive [illegible]., Philadelphia; Kennamental, Inc., [illegible]nd Latrobe Electric Steel Co., Latr[illegible]e; Standard Pressed Steel Co., Jenkintown; and McCrosky Tool Corp., Meadville, Pa.

Lempco Products, Inc., The Maxwell Co., and Noble & Stanton, Inc., Bedford; The Aro Equipment Corp., Bryan; Cincinnati Milling & Grinding Machines, Inc., Cincinnati Tool Co., Gardner Publications, Inc., The Schauer Machine Co., and The Staples Tool Co., Cincinnati; Crystal Lake Grinders, Crystal Lake; The Bellows Co., Akron; The McCaskey Register Co., Alliance; and Evans Reamer & Machine Co., New Lexington, Ohio.

* * *

Brown & Sharpe Mfg. Co., Circular Tool Co., Inc., and Federal Products Corp., Providence; Taft-Peirce Mfg. Co., Woonsocket, R. I.; Arthur S. Brown Mfg. Co., Tilton; and Greenerd Arbor Press Co., Nashua, N. H.; Jones & Lamson Machine Co., Springfield, Vt.

Hardinge Bros., Inc., Elmira; Standard Gage Co., Inc., Poughkeepsie; Lipe-Rollway Corp., and Porter-Cable Machine Co., Syracuse; Wales-Strippit Corp., N. Tonawanda; Bausch & Lomb Optical Co., Screw Machine Publishing Co.—*Screw Machine Engineering;* and Weddell Tools, Inc., Rochester; Nelco Tool, Inc., and A. Schrader's Son Div., Brooklyn, N. Y.

Hammond Machinery Builders, Inc., and Kalamazoo Tank & Silo Co., Kalamazoo; Index Machine & Tool Co., and Macklin Co., Jackson; Beaver Tool & Engineering Corp., and Royal Oak Tool & Machine Co., Royal Oak; Microbore Co., Ferndale; Physicists Research Co., Ann Arbor; The Lufkin Rule Co., and Severance Tool Industries, Inc., Saginaw, Mich.

* * *

O'Neil-Irwin Mfg. Co., Lake City; Sales Services Machine Tool Co., St. Paul; and Tubular Micrometer Co., St. James, Minn.; South Bend Lathe Works, South Bend; and R. B. Annis Co., Indianapolis, Ind.; Schmarje Tool & Engineering Co., Muscatine, Iowa.

Walker-Turner Co., Inc., Plainfield; Accurate Bushing Co., Garwood; and Keuffel & Esser Co., Hoboken, N. J.; Delaware Tool Steel Corp., Wilmington, Del.; Gerotor-May Corp., Baltimore, Md.; Sunnen Products Co., St. Louis; and Wendt-Sonis Co., Hannibal, Mo.

Barnes Drill Co., and Rockford Magnetic Products Co., Rockford; Sapphire Products Div., Elgin National Watch Co., Aurora; Micro Switch Div. of First Industrial Corp., Freeport; The DoAll Co., Des Plaines, Ill.; Benchmaster Mfg. Co. and Diamond Machine Tool Co., Los Angeles, Calif; and DCMT Sales Corp., Rockaway Beach, N. Y.

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T.E.'s Heard on the Air In Automotive Broadcast

Detroit, Mich.—The tool engineer's place in over-all production of automotive cars and trucks was presented in the radio program, "Auto Horizons," broadcast November 16 from Station WJR.

Participating in the discussion were Grant S. Wilcox, Jr., ASTE Director, taking the part of the consumer; Leslie Bellamy, Detroit Chapter Chairman, representing supply; and Harry Murray also of Detroit Chapter, speaking for engineering design and service.

Asked by the announcer for his definition of tool engineering, Mr. Wilcox responded that tool engineering is that branch of engineering devoted primarily to the process of manufacturing. If it weren't for the engineering of tools for the production of a commodity, there would be no product, or the cost of the article would be prohibitive.

Mr. Bellamy explained some of the newer developments in tool engineering, such as the multiple purpose tool, and the benefits the consumer can expect to derive from them.

The tool engineer, Mr. Murray stated, is the hub of the whole modern production wheel; he must determine the ways and means of mass producing goods.

Questioned as to how he thinks production affects peoples throughout the world, Mr. Wilcox replied that the standard of living in this and every other country is in direct ratio to the productivity of every man, woman and child living within that group.

Other points brought out during the broadcast were the possibility of the automatic factory, the relative unimportance of initial tooling cost to the ultimate production, and the increased supply of tool steels and other metals.

Sanborn Doubts Value Of Hardened Gears

South Bend, Ind.—George H. Sanborn, Chief Field Engineer of The Fellows Gear Shaper Co., Springfield, Vt., addressed South Bend Chapter at their November meeting.

The speaker opened the program by presenting a resume of elements controlling the accuracy of gears—turning the blank, hobbing or generating to shape, and final finish by shaving, grinding or lapping.

Crowned gears, Mr. Sanborn stated, have been used extensively to maintain perfect alignment. The wide use of hardened gears, developed for aircraft engines, was in most part unnecessary, he believes, because the hardness value did not warrant the number of gears damaged by cracks during hardening.

While induction hardening has now been developed to a point where cracks are largely eliminated, high cost still limits its widespread use, he added. Mr. Sanborn presented two motion pictures, "Highlights of the Art of Generating Gears," and, "Gear Manufacturing Equipment." Following the pictures an open discussion was held.

castings
metallurgy
machine tools
jigs and fixtures
engineering processing
coolants and lubricants
grinding equipment
special machines
cutting tools
welding
dies

NOW YOU CAN LEARN THE ANSWERS . . .

- To those tough technical problems hampering your efforts to produce better goods at lower cost.
- For a group of nationally-known engineering experts, largely ASTE members, will appear at

THE TOOL ENGINEERS' QUIZ

A.S.T.E. 16th Annual Meeting
and
Sixth Industrial Exposition

Cleveland Public Auditorium, 8:00 P. M., March 17

. . . To answer the 25 best technical questions, submitted by the ASTE membership and selected by the National Program Committee, and as many more from the floor as time permits.

. . . And that's not all—the sponsor of each of the 25 questions chosen will receive a personal certificate of appreciation and another certificate entitling him to a *free* copy of the

TOOL ENGINEERS' HANDBOOK

You can't lose . . . You may win . . . It's easy to try!

Just list, on the form below, the engineering problems you want solved (no limit to the number of questions that may be submitted), fill in the other required information and mail as directed, *to reach Detroit not later than March 1.*

One more thing—of course you'll want to be in the audience to hear the winning questions asked . . . and answered. So, make it a date for Cleveland in '48.

MR. ROBERT W. FORD, National Program Chairman
American Society of Tool Engineers
1666 Penobscot Building, Detroit 26, Michigan

I HAVE (A) QUESTION(S) for consideration in The Tool Engineers' Quiz to be conducted March 17 during the 16th Annual Meeting in Cleveland, Ohio:

.....
(Please print technical questions.)

.....

.....
(Additional problems may be listed on another sheet and attached to this coupon.)

I understand that all questions submitted in this contest are to become the property of the ASTE National Program Committee.

Signed .....

Address .....
(Street) (City and Zone) (State)

Chapter Name..... Date.....

ENTRIES MUST REACH DETROIT BY MARCH 1, 1948

Members to Indicate Preference for Directoral Candidates

Special Nominations to Close January 31 Under Amended Legislation

EVERY ASTE MEMBER with voting rights has a serious responsibility to attend the January meeting of his Chapter and give careful consideration to the candidates for Society Directors who will administer ASTE affairs during the 1948-49 term.

It is especially important that he discharge this privilege and obligation of Society democracy, since changes in voting procedure authorized in the October meeting of the Board of Directors prevent nominations from the floor of the House of Delegates and make January 31st the deadline for presenting special nominating petitions.

W. B. Peirce
President
Chm. of Board

L. B. Bellamy
Mem., Natl. Standards Com.

K. L. Bues
Director

H. E. Collins
Director

W. A. Dawson
Natl. Secy.

Brochures, describing the candidates' qualifications and illustrated with the aspirants' photographs, will be distributed at January Chapter meetings, along with forms for indicating preferred nominees for the guidance of Chapter Delegates who will cast the deciding ballots.

Twenty-one candidates have been selected by the Annual Nominating Committee, elected during the fall Board meeting and composed of A. M. Sargent, Chairman (Detroit), W. W. Appleton (Toronto), F. J. Dawless (New Haven), W. J. Gamble (Buffalo-Niagara Frontier), and F. J. Schmitt (Chicago).

Of these, 20 are eligible for election to the 10 directorships to be filled by the House of Delegates at its meeting in Cleveland, March 18.

The twenty-first candidate, W. B. Peirce, President and Chairman of the Board, becomes the eleventh Director as stipulated in the Constitution (Div. 1 Page 3, Lines 50-53):

The retiring President shall automatically become a Director from the date of his retirement until the next Annual Meeting.

Also mandatory is the nomination of the remaining incumbent National Officers as directoral candidates, according to the Constitution (Div. 1, Page 3, Lines 53-58) which states:

The Vice-President and/or Vice-Presidents, Secretary, and Treasurer shall automatically become nominees for Directors, and their names must be placed on the ballot for the next succeeding election of Directors.

Qualifying in this classification are: I. F. Holland, First Vice-President and incumbent Director (Hartford), R. B. Douglas, Second Vice-President and incumbent Director (Montreal), G. C. Johnson, Third Vice-President (Rockford), W. A. Dawson, National Secretary (Hamilton), and V. H. Ericson, National Treasurer (Worcester).

Other incumbent Directors who are nominees for re-election are: K. L. Bues (Golden Gate), H. E. Collins (Houston), T. J. Donovan, Jr. (Philadelphia), H. L. Tigges (Toledo) and G. S. Wilcox, Jr. (Detroit).

J. J. Demuth
Chm., Natl. Con. and By-Laws Com.

T. J. Donovan Jr.
Director
Mem., Natl. Con. and By-Laws Com.

R. B. Douglas
2nd V.-President
Director

V. H. Ericson
Natl. Treasurer
Mem., Natl. Finance Com.

C. V. Briner (Cleveland), C. B. Cole (Chicago) and A. M. Sargent of the present Board have withdrawn their candidacy.

Additional candidates chosen by the Nominating Committee are: L. B. Bellamy (Detroit), J. J. Demuth (St. Louis), R. W. Ford (Pittsburgh), W. J. Gamble, G. A. Goodwin (Dayton), C. J. Lindegren, Sr. (Worcester), W. B. McClellan (Detroit), H. B. Osborn, Jr., (Cleveland), M. L. Roessel (Rochester) and M. M. Ross (Wichita.).

In its report to the membership the Nominating Committee says in part:

Please be informed that, should you feel that the Annual Nominating Committee has failed in selecting trained, experienced and qualified candidates which meet your approval, you may exercise the privileges to which you are legally entitled, by organizing a Special Nominating Committee. The By-Laws regarding the Special Nominating Committee, as amended by the Board of Directors in session in Boston, read as follows:

According to the Constitution, Div. 1, Page 5, Line 90, twenty or more Senior Members of the Society entitled to vote may constitute themselves a Special Nominating Committee with the same power as the Annual Nominating Committee and subjected to the same procedures.

After the publication of the National Annual Nominating Committee's Report, a Chapter and/or twenty members desiring to avail themselves of this privilege, shall prepare a petition as outlined in Articles 1-2-3-4-5 of Div. 4, Page 2, Lines 40-45, 66-75; together with all statistical and biographical information for each nominee as required. This should also include the nominee's willingness to accept the nomination, subject to possible election.

This petition, together with the required signatures, must be sent to the Executive Secretary who shall immediately distribute copies to all Chapter Chairmen signifying the intention of this Special Nominating Committee.

All special nominating petitions must be presented to the National Office before February 1st of each year after which time special nominations shall be declared closed. No nominations for Directors shall be accepted from the floor of the House of Delegates.

Such names submitted will be included on the printed ballots for the House of Delegates.

R. W. Ford
Chm., Natl. Program Com.

W. J. Gamble
Mem., Natl. Public Relations Com.

The members of the Annual Nominating Committee are unanimous in the recommendation that you carefully consider the following:

The American Society of Tool Engineers has now become a vital and recognized part of the American Way of Life. Its activities are multitudinous and varied. The National Directors are your business representatives filling an im-

portant job with high responsibilities and without remuneration. On their ability to function properly may depend the future of the profession of tool engineering and of your Society.

A Director, therefore, should be thoroughly familiar with the work of all the committees, both Chapter and National; have served as a Chapter Officer; thoroughly understand the Constitution, By-Laws and Procedures of the Society; and in addition, be a recognized and able business administrative executive.

Qualifications and Society experience of the several nominees are as follows:

LESLIE B. BELLAMY—District Mgr., Detroit Office of Sterling Grinding Wheel Div., Cleveland Quarries. Senior member since 1939. Incumbent Chm., Detroit Chapter; member, Natl. Standards Com., and Chm., Data Sheet Sub-Com. Former Chapter Standards Chm. Long experience in tool design and as Chief Tool Research Engr. with leading automotive company. Member and ASTE Rep. on Vocational Guidance Com., Engineering Society of Detroit; active in other technical, professional and civic organizations.

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KARL L. BUES—Consulting Mfg. Engr., San Francisco, Calif. Senior member since 1939. Charter member, former Secy. (two terms), V.-Chm., Chm., Publicity, Editorial, Standards, Education, and Program Chm., Golden Gate Chapter. Acted as Western Area V.-Chm., Natl. Industrial Relations Com. Incumbent Natl. Director. Industrial executive and tool engineer since 1923. Member, California State Board of Education Apprentice Training Com.; instructor in Tool Eng'g and Production Eng'g at University of California. A regular contributor of technical articles to trade publications.

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HAROLD E. COLLINS—Chief Production Engr., Hughes Tool Co., Houston, Texas. Senior member since 1939. Charter member and Past Chm., Houston Chapter. Incumbent Natl. Director (2 terms). Industrial executive and tool engineer. Active in other technical societies.

G. A. Goodwin
Chm., Natl. Finance Com.

I. F. Holland
1st V.-President
Director

* * *

WILLIAM A. DAWSON—Branch Mgr., F. F. Barber Machinery Co., Hamilton, Ont., Can. Senior member since 1940. Charter member and first Chm., Hamilton Chapter. Past Director and Past Natl. Asst. Secy. and Treas. (two terms), and former member Natl. Editorial Com. Incumbent Natl. Secy. Industrial executive in plant management and tool engineering since 1930. Active in numerous professional, technical and civic organizations. Holds B.S. in M.E.

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JACOB J. DEMUTH—Gen. Supt., member of Executive Com., Sligo Iron Store Co., St. Louis, Mo. Senior member since 1941. Has served as 2nd V.-Chm., 1st V.-Chm., and Chm., St. Louis Chapter; V.-Chm. and incumbent Chm., Natl. Constitution and By-Laws Com. Wide and varied experience in responsible industrial positions. Registered Professional Engineer and member of other technical societies.

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THOMAS J. DONOVAN, JR.—Owner, Donovan Co., Philadelphia, Pa. Senior member since 1938. Charter member and Past Chm., Philadelphia Chapter. Incumbent Natl. Director; member Natl. Constitution and By-Laws Com. Wide industrial and executive experience; active in other technical associations.

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ROBERT B. DOUGLAS—Pres., Godscroft Industries, Ltd., Montreal, Que., Can. Senior member since 1942. Charter member, former 2nd V.-Com., 1st V.-Chm. and Chm., Montreal Chapter. Has served as area V.-Chm., Natl. Standards Com., Chm., Honor Awards Com., and on Publications and other special committees. Incumbent member Handbook Com. and Chm., Com. on Professional Engineers. Incumbent Natl. Director (third term) and 2nd V.-Pres. Industrial administrative executive and engineer

W. B. McClellan
Chm., Natl. Editorial Com.

H. B. Osborn, Jr.
Chm., Natl. Public Relations Com.

G. C. Johnson
3rd V.-President

C. J. Lindegren, Sr.
Mem., Natl. Membership Com.

since 1938. Active in numerous technical and professional associations; holds M.S.

* * *

VICTOR H. ERICSON—V.-Pres., Johnson de Vou, Inc., Worcester, Mass. Senior member since 1939. Former Editorial Chm., Worcester Chapter. Has been Area V.-Chm. (two terms) and Chm., Natl. Membership Com. Incumbent Natl. Treas. (two terms), and member Natl. Finance Com. Outstanding authority on grinding processes.

ROBERT W. FORD—Field Engr., Ex-Cell-O Corp. Graduate, Mechanical and Industrial Eng'g. Senior member since 1938. Has held various offices in Pittsburgh Chapter, culminating in chairmanship. Has been 2nd and 1st V.-Chm. and is now Chm., Natl. Program Com. Active in other technical and social organizations. Wide and varied experience in tool engineering.

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WILLIAM J. GAMBLE—Partner, Gamble and Gamble, Buffalo, N. Y. Senior member since 1938. Has served as Chapter Chm. and Chm., Resolutions and Membership Coms., Buffalo-Niagara Frontier Chapter. Past Natl. Director and incumbent member, Natl. Public Relations Com. Industrial and production executive since 1911. Has held office in numerous nationally known technical and civic organizations.

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GEORGE A. GOODWIN—Chief Process Engr., Master Electric Co., Dayton, Ohio. Senior member since 1938. Charter member, former V.-Chm., Chm., and committeeman, Dayton Chapter. Has been Natl. Director (1 term); member, and now Chm., Natl. Finance Com. Has served in engineering and executive capacities since 1910; also active in other technical and civic organizations.

H. L. Tigges
Director

G. S. Wilcox, Jr.
Director
Mem., Natl. Standards Com.

M. L. Roessel
Mem., Natl. Education Com.

M. M. Ross
Mem., Natl. Membership Com.

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IRWIN F. HOLLAND—Gen. Supt., Small Tool and Gauge Dept., Pratt & Whitney, Div. Niles-Bement-Pond Co., W. Hartford, Conn. Senior member since 1936. Has served Hartford Chapter as Program, and Constitution and By-Laws Chm. and Chapter Chm. Is past Chm., Natl. Editorial Com., Natl. Nominating Com., Natl. Resolutions Com., and Natl. Constitution and By-Laws Com. (three terms); member, former Organization Progress Com. Incumbent Natl. Director (four terms) and 1st V.-Pres. Industrial production executive since 1915. Active in various technical and professional societies.

(Concluded next page.)

GEORGE C. JOHNSON—Factory Mgr., W. F. & John Barnes Co., Rockford, Ill. Senior member since 1937. Charter member and Past Chm., Rockford Chapter where he has held various other offices. Former member, Natl. Membership Com., V.-Chm. Natl. Finance Com., and Natl. Secy. Incumbent 3rd V.-Pres. Experience covers several years of progressive responsibility as industrial executive.

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CARL JOHN LINDEGREN, SR.—Pres. and Treas., Lindco, Inc., Worcester, Mass. Senior member since 1939. Charter member, Past Treas., V.-Chm., and Chm., Worcester Chapter. Formerly a Regional Director, N. E. V.-Chm., Natl. Constitution and By-Laws Com., and member, Natl. Editorial Com. Now a member of Natl. Membership Com. Assisted in chartering Worcester, Springfield (Mass.), Boston, Twin States, Little Rhody, and Portland (Me.) Chapters. Has held responsible positions in industry since 1910. Has led and participated in civic, fraternal and other community activities.

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WILLIAM B. McCLELLAN—Sales Engr., Gairing Tool Co., Detroit, Mich. Senior member since 1935. Has been 2nd V.-Chm., 1st V.-Chm., and Chm., Detroit Chapter, in addition to serving as Chm. of several Chapter Coms. Former V.-Chm., Natl. Program Com.; now Chm., Natl. Editorial Com. (2 terms). Active in other technical societies.

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HARRY B. OSBORN, JR.—Sales Mgr., Tocco Div., Ohio Crankshaft Co., Cleveland, Ohio. Senior member of Cleveland Chapter since 1943, incumbent Chapter V.-Chm., and Chm., Natl. Public Relations Com. Former instructor and Assoc. Professor of Chemical and Metallurgical Eng'g. at Lehigh University. Active in numerous technical, engineering, professional and allied societies. Holder of B.S., M.S. and Ph. D. degrees.

* * *

MILTON L. ROESSEL—Partner, Rekers & Roessel Tool Engineering Service, Rochester, N. Y. Senior member since 1938. Has been Secy., Treas., 1st, 2nd, and 3rd V.-Chm., and is now Chm., Rochester Chapter. Former member Natl. Editorial Com. (two terms), and incumbent member Natl. Education Com. (three terms). Skilled in tool design, process engineering and supervision. Active in other technical societies.

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MILBURN M. ROSS—Owner, Ross Engineering & Equipment Co., Wichita, Kans. Senior member since 1941. Charter member, Wichita Chapter where he has held various offices culminating in chairmanship. Incumbent member, Natl. Membership Com. (two terms). Outstanding experience as aircraft, production and tool engineer and designer. Active as officer in various technical and civic organizations.

* * *

HERBERT L. TIGGES—V. Pres., Baker Brothers, Inc., Toledo, Ohio. Senior member since 1936. Has served on Natl. Editorial Com. Incumbent Natl. Director. Wide and varied experience in responsible industrial positions. Director and Chm., Sales and Service Com., Natl. Machine Tool Builders' Assoc. Director, Amtea Corp., New York City. Active participation in numerous technical, professional and civic organizations.

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GRANT S. WILCOX, JR.—Asst. Factory Mgr., Plymouth Div., Chrysler Corp., Detroit, Mich. Senior member since 1937. Has served as Editorial Chm., V.-Chm., and Chm., successively, Detroit Chapter. Is Past Chm., Sub-Committee, Natl. Standards Com., and incumbent member, N. S. C. Incumbent Natl. Director (2nd term). Industrial executive in tool engineering since 1939. Former V.-Chm. and Chm., Engineering Societies Affiliate Council, Detroit. Holder of B.S. in M.E., and registered Professional Engineer. Author of articles on tool engineering and aviation.

Cites Production Economy Of Resistance Welding

San Francisco, Calif.—Important to modern tooling methods are the jigs and fixtures used in production resistance welding, Arthur D. Lewis of the Art Lewis Production Equipment Co., Glendale, told Golden Gate Chapter, November 25, in a lecture illustrated with motion pictures describing the three popular methods of resistance welding—spot, roll, and projection.

Of especial interest was his explanation of the variation known as upset butt welding in which two pieces are heated and pushed together, such as the 2½" diameter harbor chain made in such large quantities during the war, where two half links are joined by this efficient and fast method.

Flash butt welding on scraps of sheet steel, a method which seems to offer partial relief to sheet scarcity, was discussed. While not suitable where the surfaces are visible, this simple and inexpensive means of patching sheet scrap together has some application in automobile body construction, and probably for inner panels of furniture and cabinets.

Spot welders were recommended as a fast and useful tool for brazing, and stitch welding with a gun was defined as a very low cost method of joining. With proper equipment 350 to 400 spots can be made per minute, it was claimed.

It is possible, the speaker said, to utilize unskilled labor for most forms of resistance welding, and to produce parts in fewer operations than required by die-formed, screwed or riveted assemblies. Fixtures used must be capable of tightly holding matching panels, but otherwise may be of conventional design.

At the close of Mr. Lewis' lecture, Howard Dally, Electrical Engineer of the same company, offered suggestions concerning installation of spot welders. He cautioned prospective users to check with power companies first, as frequently it is found that installed transformers have insufficient capacity for the operation of welders.

A motion picture following the talk illustrated General Electric Co. resistance welding controls.

Cutting Tool Findings Will Aid Industry

Elmira, N. Y.—"Exploring the Possibilities of Single Point Carbide Turning" was the subject presented by Frank P. Cavenagh, Research Engineer of The Warner & Swasey Co., Cleveland, Ohio, at a meeting of Elmira Chapter, December 1, in the Mark Twain Hotel.

Mr. Cavenagh's talk concerned the research program being conducted by Warner & Swasey in the field of carbide cutting tools. He described a special high powered, high speed turret lathe for steel cutting tests, and the strain gages and pressure gages used to check cutting tool speeds and feeds, with various grinds. The valuable data assembled from these experiments will be useful in industry, the speaker pointed out.

A lively question and answer period and the showing of the Warner & Swasey film, "Chips," followed the talk.

Another motion picture, "Golden Horizons," concluded the program. An Ampco Metal production, the film depicts the history and development of copper base alloys from primitive times, showing the tremendous strides made since man's discovery that copper could be worked into useful articles.

Chairman Edward Stachel presided over the meeting attended by 30 members and guests. Vice-Chairman James Deegan was in charge of the technical session and introduced the speaker.

Winfrey Forms Company

Cambridge, Mass.—Walter E. Winfrey, Membership Chairman of Boston Chapter, ASTE, has formed the Walter E. Winfrey Co., manufacturers agents in Eastern Massachusetts, Rhode Island, New Hampshire and Maine.

Mr. Winfrey's company has been appointed representatives of Robert H. Clark Co., Beverly Hills, Calif., and the M. A. Ford Mfg. Co., Inc., of Davenport, Iowa.

In addition the firm is the exclusive representative in Boston and the surrounding territory for Vascoloy-Ramet Corp.

Long associated with the cutting tool business, Mr. Winfrey has specialized in tungsten carbide and cast alloy tools. He served as Reception Committee Chairman for the recent ASTE Semi-Annual Meeting in Boston.

Shows Air Devices, Uses

New Haven, Conn.—A. S. Terry, Sales Manager of The Bellows Co., Akron, Ohio, addressed New Haven Chapter at a dinner meeting November 3 in Denham Laboratory, Yale University.

The speaker opened his talk with motion pictures showing various applications of air equipment as applied to drilling, milling and grinding. At the conclusion of the films, Mr. Terry gave a few highlights on the subject and conducted a question and answer period.

President W. B. Peirce receives a leather case from Paul H. Magnus (left), Pittsburgh Chairman, on behalf of Chapter, as memento of Executives Night honoring Mr. Peirce. Between them is W. H. Schott, immediate Past Chariman

Home Chapter Honors Peirce at Executives Night

Pittsburgh, Pa.—In a special Executives Night program honoring their fellow member, President W. B. Peirce, Pittsburgh Chapter played host to 25 leading industrial executives and educators from the Pittsburgh area, at a dinner meeting November 7 in Hotel Webster Hall.

Speaker of the evening was C. V. Briner, Director and Past President of the Society, who explained the development and structure of ASTE and the tool engineer's place in industry. Mr. Briner pointed out that the Society, through its various services, benefits the individual member by broadening his field in the tool engineering profession, thereby profiting industry through the development of better tool engineers.

Production to Curb World Unrest

Mr. Peirce, honor guest, addressed the group on the importance of humanics to industry and to the future of world peace. He made a strong plea for increased production to alleviate the starvation and misery of war-ravished countries and to resist the impact of subversive ideologies.

Other speakers included Gen. Hugh C. Minton of the Koppers Co. and Dr. Webster N. Jones, Director of Mechanical Engineering at Carnegie Institute, whose subject was "Sharpening Human Tools of Industry."

Prof. N. Lewis Buck of the University of Pittsburgh and Otto W. Winter, National Education Chairman of ASTE, were the principal participants in an open discussion concerning the vast benefits possible for industry and the country in general, through proper cooperation between engineering colleges and the Society.

Chairman Paul H. Magnus, who welcomed the visitors, presented a black leather brief case to President Peirce on behalf of the Chapter. Mr. Briner also received a memento in token of his birthday.

Joseph Hubbard of the Keystone Adjustment Corp., toastmaster for the function, was introduced by First Vice-Chairman W. S. Risser.

Guest executives and educators included: A. R. Callendar, Aluminum Company of America; A. Fisher and J. Gordon Wills, Blaw-Knox Co.; W. A. Nelson, Carnegie-Illinois Steel Corp.; Frank Stevenson, The Cooper-Bessemer Corp.; R. W. Marvin, Dravo Corp.; R. M. Heyl, Edgewater Steel Co.; K. F. Treschow, Engineers Society of Western Penna.

E. G. Moffat and M. F. Judkins, Firth Sterling Steel & Carbide Corp.; Andrew A. Hocher, Hubbard & Co.; F. E. Moore, Mathews Conveyor Co.; Arlie L. Fox, Jas. H. Matthews & Co.; George H. Deike, Jr. and Charles W. Punton, Mine Safety Appliances Co.; Charles W. Schaffer, Pittsburgh Convention Bureau.

R. A. Mitchell, Pittsburgh Forgings Co.; Walter Russell, Pittsburgh Press; J. M. Yahres, Pittsburgh Screw & Bolt Co.; John L. McGara, H. K. Porter Company, Inc.; M. L. Douglas, Russell, Burdsall & Ward Bolt and Nut Co.; and C. G. Thornburgh, The Rust Engineering Co.

Society officials present among the 154 attending the function included: V. H. Ericson, National Treasurer, of Worcester, Mass.; R. W. Ford, National Program Chairman, of Pittsburgh; and Harry E. Conrad, Executive Secretary, from the Central office in Detroit.

Coopland Says Speaking Is Like Game of Golf

Elmira, N. Y.—Harry Coopland, lecturer, was the featured speaker at Elmira Chapter's annual Ladies Night held November 17 in the main ballroom of the Mark Twain Hotel.

Mr. Coopland's address, "So You Have Been Asked to Speak," was a humorous as well as an educational treatise on public speaking. He compared speaking to a game of golf in its various phases —the practice required, keeping one's eye on the ball, the swing and follow through.

Before developing the serious side of his subject, he regaled his listeners with a number of humorous stories.

Mr. Coopland's talk was preceded by a banquet, and entertainment by Leo Lyno, a local magician.

Chairman Edward Stachel acted as master of ceremonies for the function attended by 75 members, wives, and other guests.

Multi-Operation Machine Versatile in Applications

Toronto, Ont.—"The variety of parts that can be economically produced in the Multi-Slide, singly or in multiples, is practically unlimited," said W. B. Powers, Secretary of the U. S. Tool Co., speaking November 5 before a capacity audience of Toronto Chapter members.

The future and high production are linked with automatic machinery, the speaker emphasized. This particular field offers solution to the world's economic ills in general, and the surface has only been scraped, he assured his listeners.

A unique feature of the Multi-Slide, the speaker claimed, is that it eliminates the handling of parts between operations. It permits many complicated operations to be performed in any desired sequence, and smoothly, as the flow of power is so timed that operations are well distributed and do not occur at any given instant.

Another advantage, Mr. Powers added, is the use of tools built up in sections and placed in die sets. This permits easy adjustments or change of individual punches and dies to suit modification in the design of the part being made. Long life and low maintenance of tools were named as other important considerations.

Setups Seen in Slow Motion

Motion pictures showed the machine producing precision parts with apparent ease. Setups and methods of setting the machine were shown by slow motion, the speaker explaining in detail the more intricate points.

Mr. Powers answered numerous questions from the audience and displayed a variety of sample parts.

Douglas Wright of the National Education Committee reported on meetings he had attended at the Boston convention, emphasizing the time and thought expended in planning the Society's educational program.

John L. Lengbridge, First Vice-Chairman and Education Chairman of the Chapter, also spoke on education. Response to the Chapter's evening courses was very encouraging, he stated, over 65 applicants having registered the first evening, with many more enrollments expected during the week.

Chairman L. M. Jardine presided and commented on the good turnout of 230 members.

Hydraulic Power, Control Offer Wide Applications

Columbus, Ohio—Columbus Chapter met November 12 at Hotel Fort Hayes to hear George Chinn, Chief Engineer of the Gerotor May Corp., Baltimore, Md., discuss "Hydraulics for Industry."

Touching briefly on many phases and possibilities of hydraulic equipment for control of power applications, Mr. Chinn impressed his audience with the vastness of the hydraulic field. Slides illustrated the lecture which was followed by a question and answer period.

Among the 60 members and guests present were visitors from as far as Cincinnati and Dayton.

Technical Quiz Pays Off With Silver Dollar Awards

Philadelphia, Pa.—"Information Please," a technical quiz program conducted by James J. Donovan, Jr., ASTE Director and Chapter member, was the highlight of a recent dinner meeting of Philadelphia Chapter at the Engineers Club.

Mr. Donovan was assisted in this novel presentation by J. Whitney, Asst. Works Manager, Heintz Mfg. Co., John Whitesell, Chief Engineer, Edward G. Budd Mfg. Co., and Foster M. Crayton, owner of a local metal fabricating and machine business, who served as a board of experts.

Each member who submitted a question that the experts answered incorrectly received a silver dollar. Every question directed by "Professor" Donovan to a member in the audience and answered correctly made the informant a silver dollar richer, with half-dollars to those coming up with partial solutions.

The amount of information divulged concerning tooling, heat treating and general subjects, and the spirited manner in which the program was conducted created an evening of education and good fellowship.

Delegate-Alternate P. A. Patterson and First Vice-Chairman Samuel R. Boyer circulated among the audience with portable microphones.

Employment Service Presented

Prior to the main feature, C. F. Johnson, Manager of the Technical Service Committee at the Engineers Club, explained the purpose of the service maintained by the joint engineering societies to provide employment and technical guidance. Unemployed engineers and especially ex-service men were urged to contact the Committee.

Harold W. Scott, Vice-President of the Pennsylvania Co., spoke also in support of the Red Feather campaign.

Special dinner feature was the presentation of a film, "Cruise of the Thunderbird Around the Horn," by Edward Kirkland of Wildwood, N. J.

F. M. Crayton, Chairman of the Good and Welfare Committee, reported the death of Harry N. Lutz, Secretary of Edgcomb Steel Co., and requested members to send cheer cards to W. F. Stegemerten, confined by illness to Devitts Camp, Allenwood, Pa.

The resignation of Clarence Hopper, Public Relations Chairman, was announced by Arthur Diamond, Chapter Chairman. Mr. Hopper, who is now located in Syracuse, N. Y., is succeeded by Thomas H. Olson. Eric A. Lund was appointed to serve as Co-Chairman of the Standards Committee while Chairman Leonard S. Subber is incapacitated by a prolonged illness.

A table was reserved for new members, each of whom was introduced by Roy Paulsen, Membership Chairman. Introductions included Victor E. Muth, a guest from Toronto Chapter.

During dinner Carl A. Rowand entertained with vocal selections. Howard W. Gross, Past Chairman, offered the invocation.

Shows Unusual Uses Of Cemented Carbides

Flint, Mich.—"New Horizons for Hard Metals" was the subject presented recently by Harry Crump, Chief Tool Sales Engineer, Carboloy Co., Inc., Detroit, before Flint Chapter members attending a dinner meeting in Fischer's Hotel, Frankenmuth.

With the aid of slides, Mr. Crump described manufacturing processes used in making tungsten carbide, and the tool tips and other wear resisting parts of tungsten and tantalum carbides. His talk was followed by a film illustrating many uses of cemented carbides.

A slender rod of the carbide may be bent or even made into a coil spring, the group learned. An interesting application of the material was shown in the form of solid boring bars which, because of their modulus of rigidity, may be used to bore straight holes up to eight times their diameter in depth.

After an open discussion period, Mr. Crump told of a visit of two underground plants in Germany. The factories, built in old quarries and entered through well-concealed mountainside entrances, were several stories high, he said.

The program concluded with the showing of a film from the Bryant Chucking Grinder Co. The graphic demonstration of the precision and flexibility of Bryant grinders, included the two-spindle machine which not only grinds internal diameters but may be used for facing operations either outside or at the bottom of the hole.

Harlan Pierpont, First Vice-Chairman, opened the meeting and L. A. Kitchen, Past Chairman, presented Mr. Crump and his associate, Mr. Dural.

Teachers Can Be Helped By Industry Cooperation

Williamsport, Pa.—November dinner meeting of Williamsport Chapter, held at the Lycoming Hotel, featured Irwin Rowntree, Associate Professor of Industrial Education, Pennsylvania State College, as guest speaker.

Professor Rowntree in an address, "How Can Vocational Instructors Help Industry?" pointed out that a successful vocational or technical school program depends a great deal upon the instructor, whose main duty is to give more and better trained people to industry.

Such a program, he said, is helped materially by coordinating it with industry and teaching in the manner which has proved practical in industry.

A successful teacher he defined as one who knows what he is doing and how people learn. He should have a well developed program and course of material; must be able to create a desire to learn on the part of the student, and get the study material across to the pupil.

Professor Rowntree pointed out that one of industry's faults of the past has been in too much attention to production and too little consideration of workers.

Chairman Louis H. Bardo called the meeting to order and Program Chairman Delbert M. Lowrey presented the speaker.

Visiting Danish Educator Sees West Coast Plants

Oakland, Calif.—Prof. E. K. Henriksen of the Danish Royal Technical University at Copenhagen, Denmark, and member of the Gentofte Town Council, was escorted through the plants of the Nordstrum Valve Vo. and Marchant Calculating Machines Co. by Floyd Snodgrass, Chairman of Golden Gate Chapter, during a recent visit here.

Traveling as a fellow of Denmark's Amerikanske Selskab, Professor Henriksen spent two months in the United States making certain technical studies in the field of mechanical engineering, technology and industrial management, particularly in the use of machine tools, to aid him as an educator in mechanical engineering.

His two-fold mission included town engineering studies of public works and utilities, public safety and sanitation, and recreation, in connection with his work as consulting engineer to the Gentofte Town Council.

Philadelphia Chapter officers and principals appearing on a recent program featuring a technical quiz visit at the dinner table. From left: Warren W. Cady, Secretary; J. Whitney, Heintz Mfg. Co.; Samuel R. Boyer, First Vice-Chairman; Harold W. Scott, Pennsylvania Co.; Thomas J. Donovan, Jr., Director and master of ceremonies; Arthur R. Diamond, Chairman; John C. Whitesell, Edward G. Budd Mfg. Co.; Emil Kitzman, Second Vice-Chairman; and Howard W. Gross, a former Chairman of the Chapter

Standards Heads Confer With National Committee

Boston, Mass.—Several Chapters received assistance in their standards programs when J. M. McGinley, R. G. Howard and H. D. Bertholf, Standards Chairmen of Boston, Rochester and Binghamton Chapters, respectively, and G. J. Willig, Chief Tool Engineer, Bausch & Lomb Optical Co., and a Rochester Chapter member, attended a meeting of the National Standards Committee during the recent Boston convention.

The visiting Standards Chairmen were given detailed information concerning the operation of their committees. Much of the meeting was devoted to answering questions relative to the data sheet and standardization projects.

After expressing appreciation to the members of the National Committee for explaining so comprehensively the functions of their office, the local Standards men left the meeting instilled with high enthusiasm for the work to be done and with a better understanding of the efforts of the National Standards Committee.

Sapphire Outwears Steel In Measuring Abrasives

Madison, Wis.—A gage with sapphire wearing surfaces will outwear a hardened steel gage 100 to one in measuring abrasive material, John F. Ireland, Sales Manager, Sapphire Products Div., Elgin National Watch Co., Aurora, Ill., informed Madison Chapter members during a lecture, December 2 at the Lorraine Hotel, on "Sapphire—An Engineering Material."

Synthetic sapphires, Mr. Ireland revealed, are finding wide industrial application in addition to their conventional use as watch bearings.

Ingenious machines constructed for machining the stones, and operations in their manufacture, were shown in the film accompanying his talk.

Executives to Hear Berna

Houston, Texas—Tell Berna, General Manager of the National Machine Tool Builders Association, will address the Annual Executives Night of Houston Chapter, ASTE, January 13.

Guests at the yearly function will include outstanding executives from local industries and representatives of all other technical societies in the Houston area.

Public Joins Engineers At Gas Turbine Lecture

Springfield, Vt.—Speaking before a public gathering of approximately 200 members and guests of Twin States Chapter in Springfield High School auditorium, November 12, R. E. Small, head of the Turbo Jet Installation Section, Aircraft Gas Turbine Div. of General Electric Co., Lynn, Mass., explained "Aircraft Gas Turbines" and the relationship of this type of power plant to modern aircraft design.

A sound film, "Jet Propulsion," produced by Walt Disney, and slides, showing details of modern gas turbines and their installations in the latest Army and Navy experimental aircraft, illustrated the lecture.

The meeting was preceded by dinner at The Fellows Gear Shaper Co. cafeteria with 33 guests present from Springfield, Windsor and Tunbridge, Vt.; Claremont and London, N. H.; Boston and Springfield, Mass.; Hartford and Portland, Conn.

Chairman Alan Stubbs presided. George Julien, Membership Chairman, reporting a total Chapter membership of 162, announced the election to membership of: E. C. Liske, D. V. Edwards, W. H. Jones, J. H. Currie, H. E. Merrick, C. A. Pratt, and Samuel Dhanaraj; and promotion to Senior grade of R. V. Mackenzie, E. A. Bromley, R. W. Ward, and W. V. Wirkkala.

Ladies Guests at Dinner

York, Pa.—Ladies Night at Central Pennsylvania Chapter was observed November 13 with a family style dinner and an evening of entertainment at Fair Acres.

P. P. Stock, Chapter Chairman, was host at the dinner and master of ceremonies for the occasion.

The program included a variety of songs by the "Yorkco Four" and was highlighted by the guest speaker, Thomas J. Donovan, Jr., an ASTE Director, who enlightened the ladies concerning the Society's aims and functions.

Mr. Donovan then conducted a Silver Dollar Quiz Contest in which "cartwheels" were awarded for correct answers to a variety of interesting and pertinent questions.

In closing, Mr. Donovan presented the Chapter with his expense funds for the last Directors' meeting.

Gives Counterbore Talk

Fort Wayne, Ind.—Technical speaker at the November 12 dinner meeting of Fort Wayne Chapter was R. D. Seeley of Eclipse Counterbore Co., whose subject was "End Cutting Tools and Their Uses."

Mr. Seeley showed a film illustrating the manufacture and application of counterbores and a color film of the Bikini atom bomb experiment.

Prior to the technical session, Capt. Custer Dunifon, local traffic engineer, gave a coffee talk on "Safety," illustrated with two films.

Six visitors and prospective members were among the 60 attending the meeting.

* * *

A Family Night party, held earlier, filled the Chamber of Commerce Auditorium with members, their wives and children. A buffet dinner was followed by a program of entertainment and the distribution of prizes.

Reviews Crush Grinding

Milwaukee, Wis.—J. T. Welch of The Sheffield Corp., Dayton, Ohio, discussed "Crush Grinding and Its Application in Industry" before approximately 100 members of Milwaukee Chapter at a meeting November 13 in the Elks Club.

Mr. Welch traced the development of crush grinding from its origin, using slides as illustration. The numerous questions asked from the floor following his lecture were capably answered by the speaker.

The program was concluded with the showing of two sports films.

Chairman Paul Butzin presided and Program Chairman Joseph Ebner presented the speaker.

Meyer Host at Open House

Ashtabula, Ohio—Karl H. Meyer, Manager, Ashtabula Div., Reliance Electric & Engineering Co., was host to nearly 5,000 visitors from the surrounding area for an open house held November 15 at the plant.

The occasion, marking the company's swing into full production in the new factory, was observed with tours of the plant, entertainment and refreshments.

Before taking charge of the new plant, Mr. Meyer managed the company's Marine Div. in Cleveland where he is affiliated with ASTE.

Tri-State Students Hear About Society's Educational Work

Junior ASTE members from Tri-State College gather to hear address by Prof. Halsey F. Owen of Purdue University concerning the "Progress of the National Education Committee." In front row, from left, are: Harry E. Wise, Chm., Educational Sub-Committee at Tri-State; Emil W. Mellin, Fort Wayne Chapter Chm.; Omer H. Mader, Education Chm., H. Anson, K. Alterkruse, Professor Owen, Leonard C. Roebel, First V.-Chm.; Milton H. Kline, a former Chm.; and Paul R. Weitzman, Constitution and By-Laws Chm.

Standards Program Opens with Widespread Response Entire Society Membership Eligible to Participate

Detroit, Mich. — Members representing nearly every area of Society activity on the North American continent have responded to the invitation of the National Standards Committee(issued in the October *ASTE News* section) to participate in the standardization program being inaugurated in cooperation with the American Standards Association, according to W. H. Smila, National Standards Chairman.

Additional volunteers, Mr. Smila announces, are still being accepted for the many projects which will require the joint efforts of a substantial portion of the ASTE membership.

Many Subjects Represented

Committees on which service has been offered include: B1—Screw Threads, Standardization and Unification of; B2—Pipe Thread; B3—Ball and Roller Bearings; B4—Allowances and Tolerances for Cylindrical Parts and Limit Gages; B5—Small Tools and Machine Tool Elements, Standards for; B6—Gears, Standardization of; B15—Mechanical Power Transmission Apparatus, Safety Code for.

B16 — Pipe Flanges and Fittings; B18—Bolt, Nut and Rivet Proportions; B20—Conveyors and Conveying Machinery, Safety Code for; B24—Forging and Hot Metal Forming, Safety Code for; B27 — Plain and Lock Washers; B29—Transmission Chains and Sprockets; B32—Wire and Sheet Metal Gages; B33—Hose Coupling Screw Threads; B36 — Dimensions and Material of Wrought Iron and Wrought Steel, Pipe and Tubing.

B40—Pressure and Vacuum Gages, Specifications for; B46 — Classification and Designation of Surface Qualities; B52—Classification of Materials for Tools, Fixtures and Gages; Z14—Drawings and Drafting Room Practice (Exclusive of Architectural Drawings); Z15—Graphic Presentation, Standards for; Z32—Graphical Symbols and Abbreviations for Use on Drawings; Z39—Library Work and Documentation, Standardization in the Field of.

Volunteers, by Chapter affiliation, and the projects in which they have expressed interest, are: At Large—Oliver C. Heustis, B1, B2, B4, B16, B36, Z14 and Z32; Boston—Stephen P. Baldwin, B1, B2, B4, B5, B18, B27 and B52; F. E. Ward, B6, B29, Z14 and Z32; L. M. Nielsen, B46; Buffalo-Niagara Frontier—John H. Woodhull, B1, B2, B4 and B5; Robert H. Beadle, B5; Chicago—William Krzyzanowski, B3, B6 and B29; E. E. Olds, B4, B32 and B52; William R. Shrode, Z14, Z32 and Z39; Denver—George W. Buckel, Z14, Z15 and Z32.

Detroit—Leonard J. Smith, B1, B6, B29 and Z39; William A. Koch, B2, B3, B6 and B40; G. F. Bush and Earl L. Morgan, B5 and B52; Leslie C. Miller, B32, Z14, Z15 and Z32; Fairfield County —Charles F. Johnson, B5, B6, B15, B18, B27, B52, Z14 and Z32; Robert R. Rawstron, B32 and B46; Golden Gate—V. E. Diehl, B1, B2, B4 and Z14; Frank E. Menard, B11, B24 and B46; Greater New York—Walter Dimitruk, B1, B27, B32, B52 and Z32; Peter Flesch, B20.

Hartford—Thomas F. Healy, B7 and B46; Los Angeles—A. Lincoln Mager, B4, B11, B32, Z14 and Z32; Mont Gordon, B5; Madison—K. Y. Taylor, Jr., B1, B2 and B33; Northern New Jersey—Harold S. Bowman, B5, Z14, Z15 and Z32; Edward C. Granell, B5, B52, Z14 and Z32; Portland (Ore.)—Kenneth B. Horton, B5 and B18; Toledo—R. M. Place, B3; Toronto—A. G. Whitaker, B6 and B29; T. J. Croot, B18 and B24; and R. M. Blankfield, B20.

In addition, ASTE is already represented on the respective Committees by the following members: F. W. Helming, B1 (Hartford); E. J. Bryant, B4 (Springfield, Mass.); C. H. Borneman, B5 (Schenectady); Adam Gabriel, B5—Technical Committee B5.6 (Chicago); L. M. Nielsen, B5—Technical Committee 33 (Boston); Arnold Thompson, B6 (Toronto); A. M. Swigert, B46 (Detroit); E. E. Griffiths (Pittsburgh), A. F. Murray and E. W. Ernst (Schenectady); and C. E. Ives (Chicago) all serving on B52; and G. S. Bunch, Z14 (South Bend).

New Projects Suggested

Other standardization projects suggested, and their proponents, are: Inexpensive Encyclopedia of Engineering Terminology, R. R. Rawstron; Business Procedures from the Tool Engineer to Finished Product, W. R. Shrode; Screw Machine Cam Layout, William Krzyzanowski; Application of Color to Safety Engineering, R. M. Blankfield.

Colors for Steel Identification, F. E. Ward; Serial Numbers on Tools, Wrenches — Socket, Box, Open-end (Flare-nut); and Rivet Sets, K. B. Horton; T-Slot Spacing on Milling Machines and Presses (Light Stampings); and Dynamic Balancing, A. L. Mager; and Grinding in Material Resulting from Changes, T. F. Healy.

Offers to assist on the various projects listed on Page 59 of the October *Tool Engineer* should be addressed to W. H. Smila, Chairman, National Standards Committee, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

Film and Exhibit Feature Air Powered Devices

Erie, Pa.—A. S. Terry, General Sales Manager of The Bellows Co., Senacon Div., Akron, Ohio, was guest speaker at a meeting of Erie Chapter, December 2, in the General Electric Community Center.

His subject, "Application and Use of Air Powered Devices," was illustrated with a film and display of air motors, 8-volt solenoids, mechanical and electrical drill press feeds, air vises, hydro checks and power dome double acting cylinders and valves. A discussion of the display followed the film showing.

Pohle Addresses Teachers

Boston, Mass.—Walter B. Pohle, Superintendent of Spray Engineering Co., Somerville, and famous gadgeteer of Boston Chapter, ASTE, was guest speaker at a meeting of the Mechanical Drawing Association of New England, held November 15 at Massachusetts Institute of Technology and attended by approximately 300 mechanical drawing teachers.

The first industrial speaker ever invited to address the group, Mr. Pohle appeared on a program also featuring representatives of M.I.T., Harvard University, Illinois Institute of Technology, and McGraw-Hill Book Co.

His lecture, "Artistry and Ingenuity in Making Mechanical Drawings," included the solution of a specific problem, with a detailed description of the attendant drawings, jigs, fixtures and tools. Using actual parts Mr. Pohle gradually worked along to completion of the project which culminated in a demonstration of his new gadget for cutting string beans into uniform lengths for canning.

His presentation so delighted and amused the entire group that he was elected an Honorary Member of the Association, and invited to present the talk at Lincoln Technical Institute and Northeastern University Engineering, School, Boston.

Zealous for the introduction of tool engineering into school curricula, Mr. Pohle has addressed classes in other educational institutions. During World War II he made a speaking tour of New England on methods for conserving vital man hours.

Ladies Nite Audience Hears Caton Address

Rockford, Ill.—Dr. John J. Caton, retired Director and Founder of Chrysler Institute of Engineering and one of two honorary members of ASTE, addressed the annual Ladies Nite held December 4 by Rockford Chapter in the Rainbow Room of Hotel Faust. Dr. Caton's subject was "Common Sense in Education."

Dr. P. L. Ewing, Superintendent of the Rockford public school system, gave a short coffee talk immediately after dinner.

E. Y. Seborg, Chapter Chairman, was in charge of arrangements for the meeting. Music for the informal social affair was provided by a string quartet which played during dinner.

Gives Sapphire Lecture

Cedar Rapids, Iowa—Approximately 70 members and guests of Cedar Rapids Chapter turned out for the excellent technical program presented November 19 by Roger Waindle, General Manager of Sapphire Products Div., Elgin National Watch Co., Aurora, Ill.

His talk, "Sapphire—An Engineering Material," supplemented with slides and a sound film, was presented in a manner that kept the audience attentive and interested.

The coffee talk, "How to Enjoy the Movies," was presented by Rev. Waldemar Argow, a well-known local speaker.

Top executives from industrial and educational circles and national officials of ASTE were guests of Greater New York Chapter at recent Executives Night when Dr. E. U. Condon, director of the National Bureau of Standards discussed possible applications of atomic energy. From left in front row are: Karl L. Bues and Thomas J. Donovan, Jr., Directors; Harry E. Conrad, Executive Secretary, from the Central Office at Detroit; Dr. Condon and Irwin F. Holland, 1st Vice-President of the Society.

Atomic Energy Offers Great Possibilities to Industry Bureau of Standards Head Tells New York Executives

New York, N. Y.—Atomic energy has many potentialities destined to affect industry profoundly in the next few decades, according to Dr. E. U. Condon, Director of the National Bureau of Standards and a member of the committee recommending adoption of the atomic energy program to the late President Roosevelt.

Speaking at the annual Executives Night Dinner of Greater New York Chapter in Hotel New Yorker, November 3, Dr. Condon stated that the physical problems of an atomic pile have been largely solved and the problems of an atomic energy plant now are an engineering matter—principally the transfer of heat from the pile through a cooling fluid and the conversion of this heat into power. The temperatures attainable, and thus efficiency of such a plant, are limited only by the heat-resistant capacities of attendant equipment.

Dr. Condon went on to say that other industrially important aspects of atomic energy may have an even greater effect on science and technology. One of these is the feasibility of economically transmuting one element into another and of obtaining radioactive isotopes.

May Replace X-Ray Inspection

For example, the production of radioisotopes of the elements in an atomic pile may eventually result in the replacement of the expensive and cumbersome X-ray equipment. Small units of highly radioactive substances, of known life, intensity, and decay, may usurp the place of X-rays in industrial inspection and even in medical radiology.

The use of these isotopes as tracers is destined to have a tremendous influence on research in almost every field of science. Microscopic quantities of such substances can be introduced into organic or inorganic systems, and the tracers can be followed by their radiations. Dr. Condon said the research possibilities of tracers are endless.

He cited the possibility that radioactive carbon may yield important knowledge of organic processes in such diverse fields as nutrition and petroleum research. This carbon will behave as stable carbon in the system into which it is introduced, but its life history, in a sense, can be followed by the radiations it emits.

Industrially, such cheap sources of radioactivity are important in the chemical industries where the catalytic effect of radioactivity permits reactions otherwise impossible or possible only under adverse conditions such as unusually high temperatures.

Atomic piles, in addition to power, transmutation, and the production of radioactive isotopes, may be important in other ways. Thus, in metallurgy, bombardment of metals by neutrons resulting from the fission process may produce interesting results. Metals are crystalline in structure and change under neutron bombardment.

To Detect Impurities in Metals

Additional knowledge of the properties of metals and the attainment of special properties may well result from studies in this direction. Since impurities in uranium, even to the extent of a few parts per million, retard or stop the chain reaction completely, atomic piles may also be used to detect minute quantities of impurities in various materials.

These possibilities of atomic energy are merely representative, and Dr. Condon stressed the need for basic research on many fundamental problems of atomic physics. While it is true that the basic physics of an atomic pile is known, large gaps in our knowledge must be filled before all of these possibilities can be realized either safely or economically.

Among industrial executives present were: L. W. Roselieus, Pres., H. L. Cohen, V.-Pres., and M. Flaum, Asst. to Pres., S & S Corrugated Paper Machinery Co.; S. Skok, Gen. Works Mgr., and J. Frank, Chief Ind. Engr., Burndy Engineering Co.; S. K. O'Brien, Gen. Works Mgr., and H. R. Protze, Supt., R. Hoe Co.; G. Allen, Asst. Chief Engr., Intertype Corp.; H. J. Cause, Gen. Supt., and W. Uhler, Chief Engr., S. S. White General Mfg. Co.;

A. Edwards, V.-Pres. of Mfg., and C. Lasetna, Chief Mfg. Engr., Ford Instrument Co.; G. W. Allison, V.-Pres. and Gen. Mgr., and C. M. Burgwaldt, Gen. Supt. of Mfg., Mergenthaler Linotype Co.; Capt. R. D. Conrad, Brookhaven National Laboratories; D. Fraim, Works Eng'g Mgr., and J. Breimer, Mfg. Eng'g Supt., Sperry Gyroscope Co.; D. Stambaugh, Gen. Works Mgr., and A. Hanson, Asst. to Gen. Mgr., Bulova Watch Co.; H. Lenk, Chief Mfg. Engr., Schick, Inc., and Prof. K. E. Quier, Pratt Institute.

Visiting Society officials included: I. F. Holland, First Vice-President, of Hartford, Conn.; T. J. Donovan, Director, of Philadelphia, who served as toastmaster; K. L. Bues, Director, of Oakland, Calif.; A. R. Diamond, Philadelphia Chapter Chm.; and H. E. Conrad, Executive Secretary, from the Detroit office.

ASM Hosts for Lecture On Carbide Milling

Grand Rapids, Mich.—Members of Western Michigan Chapter were guests of the local ASM group at a dinner meeting, November 10, in the Rowe Hotel.

Speaker for the technical session was Michael Field of the Cincinnati Milling & Grinding Machines, Inc. His subject, "Practice and Research in Carbide Milling," included the methods and experiments used in arriving at standard milling practices. Effects of different cutting speeds and feeds for various metals was discussed and illustrated with slides.

Mr. Field brought out the importance of correct cutting tooth angles and explained how these angles are determined.

Following the talk, a film was shown depicting the research and experimental work preceding the establishment of correct speeds, feeds and tooth angles.

Little Outlines Problems In Tooling for Boilers

Akron, Ohio—Principal speaker at a recent Akron Chapter dinner meeting was W. R. Little of The Babcock & Wilcox Co. Cleveland office, who outlined some of the technical and tooling problems in building boilers.

A film, "Steam Power for Sea Power," showing the fabrication and installation of boilers in United States destroyers, was a feature of the presentation.

George J. Hartnett, Superintendent of Planning at the company's plant in Barberton, also spoke on the program which concluded with the showing of slides depicting industrial boiler installations.

J. I. Karash of the Reliance Electric and Engineering Co. gives Chicago Chapter members pointers on designing of dies for inclinable presses. Fred J. Schmitt, Chapter Chairman, is at left and other officers sit at right

Civil Service Announces Engineering Openings

Washington, D. C.—The U. S. Civil Service Commission has announced that applications for engineer positions at $5,905 to $9,975 a year will be accepted until further notice by the Executive Secretary, Central Board of U. S. Civil Service Examiners, Bureau of Reclamation, Building 1A, Denver Federal Central, Denver, Colo.

The work offered includes "the design, development or preparation of specifications for structures, machines, equipment, public works, power plants, and communication or transportation facilities involving applications of theoretical and applied mechanics and a knowledge of the strength and properties of materials" and "original research in one or more branches of engineering developing engineering applications of physical and other scientific principles."

No Written Examination

Positions to be filled are in the Bureau of Reclamation in the States of Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington and Wyoming.

To qualify for these positions applicants must meet one of the following basic requirements: (1) completion of a standard professional engineering curriculum leading to a bachelor's degree; (2) 4 years of progressive technical engineering experience; or (3) any combination of (1) and (2).

In addition, they must have had four years of broad and progressive professional engineering experience. No written test will be given; candidates will be rated on their experience and training relevant to the duties of the position.

Applications are desired from those individuals whose experience and training qualify them particularly for engineering or engineering administrative work within the specialized scope of the Bureau of Reclamation.

Further information and application forms may be secured from most first- and second-class post offices, from Civil Service regional offices, or from the U. S. Civil Service Commission, Washington 25, D. C.

Relates Foundry Process To Accuracy of Parts

Minneapolis, Minn.—Members and guests of Twin City Chapter enjoyed a profitable and instructive technical session when Carleton C. Hitchcock of R. C. Hitchcock and Sons, Minneapolis, addressed their November meeting at the Covered Wagon Cafe. His subject was "Relationship Between Foundry Process and Tool Design."

Mr. Hitchcock gave a comprehensive picture of the role the foundry plays in achieving final accuracy of machined parts. He pointed out in an interesting and very understandable manner how a tool engineer, through closer cooperation with the foundryman, can design tools which will result in greater accuracy and stability of the finished product.

The speaker, in his timely and informative talk, showed not only a mastery of the foundryman's art, but also familiarity with the tool engineer's problems.

Supplementing his lecture with samples of good and poor casting design, Mr. Hitchcock stressed do's and don't's for designing castings. He emphasized the importance of a tool engineer's decision as to the first operation in machining a casting.

Stresses Safety in Design Of Dies for Punch Press

Chicago, Ill.—Dies for inclinable punch presses should be so designed that the operator's hands are not endangered, J. I. Karash of the Reliance Electric and Engineering Co. emphasized in an address before approximately 150 Chicago Chapter members meeting December 1 in the Furniture Club of America.

His discussion included the various types of safety devices and the disadvantages of each, strippers and knockout pins, cam operated knockouts, variable speed drives for punch presses and the application of roll feeds.

With slides Mr. Karash showed properly designed dies, air ejectors, gaging for cut off dies, and the use of separating chutes to sort disks as they come from the press.

An open discussion followed his illustrated lecture.

Double Radial Rake Angle Speeds Carbide Milling

Montreal, Que.—"Double radial rake angle on carbide milling cutters provides for efficient milling of both ferrous and non-ferrous materials at high rates of metal removal," stated D. V. Stevens, Director of Research, Kearney & Trecker Corp., Milwaukee, Wis., and guest speaker at a meeting of Montreal Chapter, November 12, in the Windsor Hotel.

His subject, "Practical Application of Modern Cutting Tools," dealt with the design and use of carbide toothed milling cutters.

Illustrated with slides and a sound film, "Carbide Steel Milling," the lecture described advantages possible through efficient application of carbide tools to milling operations.

Mr. Stevens described how Kearney & Trecker conducted an extensive research program to determine requirements of milling machines capable of using carbide tools efficiently. He explained how larger, more rigid machines with greater power were developed, and the necessity of designing a cutter for maximum efficiency on the new machines. The result was the C.S.M. cutter.

Promotes Cutting Speed, Economy

Numerous design features were incorporated in this cutter. The design, tested in the research laboratory and production shop, includes double radial rake angles, radial blade location, wedge behind the blade, and forged steel bodies. Basic design and theory concerning these cutters was presented at an A.S.M.E. convention in Pittsburgh, June, 1944, by Kearney & Trecker research engineers.

"Application of C.S.M. cutters to most face milling operations will result in maximum rates of metal removal, lower power consumption, longer cutter life, and economical carbide use," Mr. Stevens affirmed.

Warning against indiscriminate use of carbide cutters for milling operations, the speaker emphasized points to be considered, such as: selecting the proper sized cutter with the prescribed number of teeth; using correct radial rake angles and the best possible machine for the job; selecting the most suitable grade of carbide; cutting at the right feed and speed; and care of the cutters.

Fifty-six members and guests attended the meeting.

Active in Design Firm

Rochester, N. Y.—Milton L. Roessel, former Asst. Superintendent of Methods at Graflex Corp., is now devoting his entire time to his own company, Rekers & Roessel Tool Engineering Service.

The design firm, in which Mr. Roessel and Howard Rekers are partners, was formed over three years ago and specializes in tool design, manufacturing analysis, and special machine design.

Both partners are members of Rochester Chapter, ASTE. In addition to serving as Chapter Chairman, Mr. Roessel is a member of the National Education Committee.

ASTE Classes Learn Designing and Use of Gages

Philadelphia, Pa.—A joint meeting of the ASTE-sponsored classes at Spring Garden Institute was conducted there November 14 by the Education Committee of Philadelphia Chapter.

Edward Glenn, one of the members who inaugurated the original ASTE classes, lectured on "Design and Use of Gages." Speaking before members of the Tool, Die and Fixture Design classes, Mr. Glenn demonstrated the various types of gages discussed.

Students were cautioned never to leave a plug gage inserted in the mating ring gage, as it would be impossible to separate them. Another group of gages mentioned included thread plug, thread ring and thread setting ring gages for checking threads.

Human Element Causes Variation

The next step in measurement development was the micrometer. Tests have shown that it is practically impossible for various individuals to measure within .0001" because of difference in touch as well as in ratchet pressure, and variance in temperature. An indicating micrometer now available can measure accurately to .00001".

The use of adjustable snap gages was described and their application for close measurements was questioned. This gage was said to be a deceptive instrument since it can sometimes be opened by forcing over oversized parts.

In explaining the construction of dial indicating gages, the speaker stressed that this type of measuring tool is not dead accurate as a micrometer because the rack and gear teeth are not perfect. But when used as a comparator, it will repeat almost precisely in checking pieces of the same size. Mr. Glenn explained that an erratic variation in tool room indicator gages should raise a question as to the flatness of the surface plate, rather than the accuracy of the indicator.

Centralizing bore gages were examined and the students were warned not to set small diameters to measuring blocks as a true size will not be obtained. Small diameters should be set to ring gages, but in larger diameters the offset is not as great proportionately.

Air gages were diagrammed and the principle of air escaping between the plug and bore and being measured by a monometer was demonstrated. This type of gage is often necessary for long bores demanding accuracy throughout.

The students were told to use standard gages modified to meet their particular needs, to save time and money. In designing special gages a reference point should be established. When the work must be dropped over the gage, a pantographic spring and indicator should be used to avoid damage to the gage.

In closing Mr. Glenn mentioned several types of fixed gages such as contour and angle gages.

Dirt Damages Bearings

Montreal, Que.—Dirt is the commonest reason for bearing failure and the principal cause of wear, Philip B. French, General Sales Manager of Ahlberg Bearing Co. of Canada, Ltd., told Montreal members during a recent address, "Care of Anti-Friction Bearings."

When foreign matter enters a bearing, it begins to wear the microscopic smoothness of the working surfaces, according to Mr. French. The fragments of metal spalled off increase the damage and presently the surfaces of races and balls are destroyed. But if the bearing can be kept absolutely clean, it will last indefinitely, he stated.

A sound film, "The Turning Point," illustrated the accuracy required in making anti-friction bearings, and described their development. Industry's benefits, through the use of anti-friction bearings, were depicted, especially in the manufacture of automobiles, aircraft, railway equipment, agricultural machines and machine tools.

Prominent among questions asked from the floor were problems concerning lubrication, fits and preloading.

Sixty-eight members and guests were present for the lecture.

A dinner group at recent Los Angeles Chapter meeting featuring technical session on 'Deep Drawing of Metals'

Deep Drawing Techniques Described by Arnold

Los Angeles, Calif.—Fred M. Arnold of Norris Stamping and Manufacturing Co. presented the technical feature, "Deep Drawing of Metals," at the November 13 meeting of Los Angeles Chapter.

Mr. Arnold explained the basic concepts of metal drawing. Between the yield point and the ultimate breaking strength of the material is the plastic range where cold working of metal must take place.

The reduction in area of a tensile specimen of low carbon steel is 65%, the maximum reduction for drawing. Ironing, he said, is possible up to a reduction in wall thickness of 45%.

From his experience at Norris, the speaker recalled that, in making steel cartridge cases, the slightest scratch on a blank would cause it to burst in the cupping operation, even though satisfactory metallurgically.

George A. Landis, coffee speaker, divulged the startling fact that of each $2500 spent for living, $700 goes for hidden taxes. In his talk, "The Problem of Estate Creation Under Present High Taxes and Low Interest Yield," he established the fact that the present anticipated life span of almost 70 years is creating more indigents as 85% of those reaching 65 do not possess as much as $250, and only 2% have $2000 or more.

Under present tax rates, he cited, $50,000 is nearly the maximum estate that can be accumulated by saving half of a $10,000 a year income for 20 years after age 40.

Dick Linch, Chapter Constitution and By-Laws Chairman and a member of the National Committee, reported on the recent Semi-Annual Meeting at Boston.

A stag party at Barney Oldfield's Country Club is to be held January 23.

Engineering Staff Shows New Carbide Applications

Toledo, Ohio—Philip McKenna, President, Douglas Porter, Toledo district representative of Kennametal, Inc., Latrobe, Pa., and a number of company engineers and representatives from other districts presented the program featured November 12 by Toledo Chapter.

Mr. McKenna, principal speaker, discussed recent developments in design of mechanically held tipped tools and clamped in solid "rounds" and various other shapes.

Slides and samples illustrated many of these applications, giving a comparison of old and new tooling methods and demonstrating postwar progress in this field. As each new application was shown, it was explained in detail by a member of the Kennametal staff.

Guests included Mrs. Philip McKenna, believed to be the first lady ever to attend a Toledo Chapter technical session. Of the approximately 200 who were present, 50 or more were from Detroit, Mich.; Tiffin, Galien, Marion, Cleveland and other Ohio cities.

Coming MEETINGS

ALL CHAPTERS—February. Election of Chapter Officers, Delegates and Alternates.

ATLANTA—January 19. Speaker from The Sheffield Corp. Subject: "Size Control and New Developments in Gaging." February 16. Speaker: A. E. Rylander, Technical Editor, *The Tool Engineer*. Subject: "The Tool Engineer's Place in Modern Society."

CLEVELAND—February 13. Special Feature. Social hour. March 15-19, ASTE Tool Engineer's Industrial Exposition and 16th Annual Meeting, Cleveland Public Auditorium.

DENVER—February 4, Oxford Hotel. Speaker: Felix Pogliano, Gates Rubber Co., Denver, Colo. Subject: "Building Quality into Gates Tires."

ELMIRA—February 2, 7:00 P.M., Mark Twain Hotel. Speaker: Paul R. Minich, District Mgr., Rack Engineering Co., Pittsburgh, Pa. Subject: "Material Handling in the Efficiently Organized Plant."

ERIE—February 3. Speaker: Willard H. Spence, Brown & Sharpe Mfg. Co. Subject: "Automatic Screw Machines and Tooling."

FLINT—January 15. Plant tour of AC Spark Plug Div., General Motors Corp. February 19. Speaker from Severance Tool Industries, Inc., Saginaw, Mich. Subject: "Midget Milling Cutters."

HAMILTON—February 13, 7:00 P.M., Ava Golf Club, Brantford, Ont., Members' night, with Chapter speakers on various subjects.

HARTFORD—February 2. Members Nite. Non-technical program. Possibly a surprise.

HOUSTON—January 13. Annual Executives Night. Speaker: Tell Berna, Gen. Mgr., National Machine Tool Builders Assn.

LOS ANGELES—January 23. Stag at Barney Oldfield's Country Club.

MILWAUKEE—February 13. Speaker: Ernest Flanders, Jones & Lamson Machine Co., Springfield, Vt. Subject: "Thread Grinding and Its Applications in the Modern Machine Shop."

PITTSBURGH—February 6. Fort Pitt Hotel. Speaker from Yale & Towne Mfg. Co. Subject: "Material Handling."

TOLEDO—January 14. Speaker from Owens-Corning Fiberglas Corp., Toledo, Ohio. Subject: "Fiberglas Industry." February. Annual Ladies Night.

New Wire Fabric Process Developed by Southwell

Nichols, Conn.—A new process for the manufacture of wire fabrics has been developed by Raymond J. Southwell. Former Sales Manager of the Campbell Div., American Chain & Cable Co., Inc., Mr. Southwell resigned this position to devote his time to the new process involving equipment of new design to make an unwoven fabric of wire bonded with plastic which welds the joints and protects the wire against corrosion.

Before joining American Chain & Cable Co., he spent many years in the manufacture and sale of wire fabrics.

Mr. Southwell, who is affiliated with Fairfield County Chapter, ASTE, will act also as consultant in the development and promotion of new products and patents.

Arc Welding Techniques Cut Tool and Die Costs

Atlanta, Ga.—"While tremendous forward strides have been made in electric welding during the past decade, much remains to be done, and future developments will entirely obsolete our present methods," said John E. Durstine in an address to Atlanta Chapter on November 17. Mr. Durstine is Southeastern District Manager, Birmingham Office, Lincoln Electric Co.

A polarized light demonstration of welded and riveted work illustrated the opening of Mr. Durstine's lecture. This presentation gave the audience an inside view of stress concentrations and explained why some apparently strong designs fail in service.

Recent developments in materials and techniques for arc welding advanced included the use of hard facing electrodes to produce inexpensive tools and dies from ordinary low alloy steels.

While not advocating that all tools should be made in this way, Mr. Durstine emphasized that this method will materially reduce tooling costs, particularly for short-run dies. Also, that some of the new electrodes with a low hydrogen content flux coating will allow arc-welding SAE-1040 to SAE-1060 steels without the usual pre-heating.

In the ensuing discussion period, the speaker answered many questions from the floor and revealed some of the metallurgical phenomena that make difficult the welding of cast iron with satisfactory, consistent results.

Axelson Promotes Pease

Los Angeles, Calif.—Robert M. Pease of St. Louis Chapter, ASTE, has been named Vice-President and Assistant General Manager of Axelson Manufacturing Co., with headquarters at the main plant in Los Angeles, according to an announcement by J. C. Axelson, President and General Manager.

Mr. Pease, formerly Vice-President and Manager of the company's St. Louis plant, was promoted following the resignation and retirement of D. F. Axelson, Vice-President in Charge of Manufacturing.

Lead Adds Machineability Reduces Production Costs

Rochester, N. Y.—November meeting of Rochester Chapter was held jointly with Rochester Chapter of ASM at Lower Strong Auditorium, University of Rochester. Approximately 150 members from both societies were present to hear Dr. Oscar E. Harder lecture on "Lead-Bearing Steels."

Dr. Harder, who is Assistant Director of Battelle Memorial Institute, Columbus, Ohio, and a Past National President of ASM, opened his address by reviewing progress in improving the machineability of steels. The addition of lead, found to improve the machineability of non-ferrous metals such as brass and bronze, provided a clue in this direction.

These developments, on which Dr. Harder was associated, were halted during the recent war. But work has been resumed and today one of the large steel companies is producing lead-bearing steel, according to the speaker.

Dr. Harder supplemented his talk with projected slides of charts showing analyses of these steels, effect on machineability, and the corresponding savings through increased production over the use of regular steels.

At the conclusion of his talk, the speaker answered many interesting and diversified questions submitted by the tool engineers and metallurgists.

Milton Roessel, Chairman of the ASTE group, introduced Charles Vaughan, President of the ASM Chapter, who spoke briefly and invited the ASTE members to attend in force the next joint meeting, to be sponsored by ASM.

Need Technical Know-How To Hold Foreign Markets

Indianapolis, Ind.—Tool engineers must be well fortified with new ideas and developments so that production can be increased and prices reduced, as European nations will be selling their products abroad as well as in America, James Mudd of The Bellows Co., Akron, Ohio, told Indianapolis Chapter members attending a dinner meeting November 6 in Hotel Lincoln.

It is therefore necessary, Mr. Mudd continued, for tool engineers to be alert and cognizant of the latest methods to meet this competition. In many cases this can be accomplished by the use of air cylinders to power machine tools, he advised. Air cylinders are ideal for use on production runs for automatic clamping operations.

Utilization of air power to modernize machines already in use is often effective in greatly increasing production, he stated.

The speaker presented two films on "Controlled Air Power in Industry." Much interest was shown in a display of air cylinders and their mechanisms.

A social dinner hour preceded the meeting conducted by Chairman John Horton. During the evening the group attending the recent regional meeting in Cincinnati was accorded a vote of thanks by the Chapter.

Situations Wanted

METHODS ENGINEER—Broad experience on processes, tooling and cost analysis. Desires to locate in Middle West. Prefers connection with large or medium sized production shop. Married. Please reply to Box 137, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

PRODUCTION ENGINEER—28, B. S., Industrial Administration. Six years' progressive experience in machine and tool design, and supervision of process engineering. Adaptable; desires responsibility. Former A.A.F. officer; married; prefers South or West. Please address Box 138, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

SALES ENGINEER—38, 13 years' experience in engineering design and sales field, desires position as representative for machine tool, tool and gage manufacturers in the Rio Grande Valley. Best of references furnished. Address Box 136, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

'Crush Dressing' Attracts Year's Record Attendance

Hamilton, Ont.—November meeting of Niagara District Chapter was the largest of the year, approximately 170 members attending the dinner and technical session at Walper House, Kitchener.

Speaker for the evening was F. L. Curtis, Manager, Sales Engineering Dept., Norton Co., Worcester, Mass. His talk, "Crush Dressing," was preceded by an interesting Norton film and followed by a question and answer period.

Percy Barber introduced the speaker and Lester Ziegler thanked him at the conclusion of his address. Entertainment was in charge of Harry Sehl and Alex Welker and consisted of dinner music and several selections before the technical program.

Attendance included members and visitors from Hamilton, Brantford, Galt, Guelph, Preston and Kitchener.

Lectures on Sapphire

Richmond, Ind.—John F. Ireland of the Elgin National Watch Company presented a motion picture lecture on the manufacture of jewel bearings before 82 members and guests of Richmond Chapter, November 18, at the Leland Hotel.

Mr. Ireland followed the manufacture of the gems from the preparation of the sapphire crystal to the finished watch jewel.

Guests included Rev. William G. Everson of the First Baptist church, R. C. Kolb, Peoria Chapter Chairman, and R. L. Guimont of Indianapolis.

Recognition was given Carl Van Ausdall, who received an award from The James F. Lincoln Arc Welding Foundation in an international contest.

Plastics Tooling Demands High Engineering Skill

Poughkeepsie, N. Y.—C. A. Sundstrom, Product Engineer, Plastics Div. Chemical Dept., General Electric Co., spoke to Mid-Hudson Chapter members November 11 on the subject, "Plastics Parts and Molds Design." The speaker stated that the plastics industry today constitutes a $500,000,000 business with countless possibilities still undeveloped.

Mr. Sundstrom confined his talk to phenolics and explained the two main classifications, "thermosetting" and "thermoplastic," both formed by application of heat and pressure in a mold of the desired form.

React Differently to Heat

Thermosetting plastics are comparatively easy to mold and have dimensional stability over a wide range, but cannot be remolded economically.

Thermoplastics are subject to cold flow at room temperatures and will not maintain shape at elevated temperatures. This type can be remolded.

The speaker covered in some detail the base materials used in phenolics, such as: nylon, cellulose acetate, cellulose acetate butyrate, acrylics, polystyrene, vinyles, ethyl cellulose, ureas and melamines with fillers such as wood flower, cotton flock, rag, asbestos, mica, graphite, diatomaceous earth, barytes and nut shell flour. He explained also the use of laminations where special strength is required.

Plastics, Mr. Sundstrom added, have a wide range of color possibilities and general application, but the selection of materials and designing of parts and molds demand capable engineering for each application.

The talk was illustrated with a variety of finished samples and a colored film. Considerable discussion followed.

Prior to the business and technical session, Humphrey F. Hedgecock, of the New York State Conservation Dept., described "How New York State Protects its Forests."

John L. Petz, Chapter Chairman, presided at the meeting.

Recommends Fork Trucks As Saving Labor, Space

St. Catharines, Ont.—"Material handling is a comparatively new and a most necessary subject in production plants today," said T. J. McArthur, Material Handling Engineer of the J. H. Ryder Machinery Co., Ltd., Toronto, at a meeting of Niagara District Chapter in Hotel Queensway, November 13.

Mr. McArthur compared material handling to the vital transportation and delivery services of everyday life. He emphasized use of the fork truck as an outstanding achievement in material handling, quoting an American government statement that the handling of army material would have required three million men to replace fork trucks alone.

"Fork trucks have reduced direct labor in material handling to a minimum and have increased storage space in warehouses to a maximum by piling in tiers to ceiling level instead of on a surface basis," Mr. McArthur explained.

In mass production, he declared, material handling is the last bulwark to be overcome. With this in mind, management in all industries should make a concentrated study of the subject, he added.

The speaker showed films of wartime material handling at Boeing Aircraft Co. and slides of material handling in several industries.

Henry Hendriks of Lightning Fastener Co., and a Chapter member, spoke briefly on diecasting and showed colored sound motion pictures on the subject.

Schwab Discusses Methods

Erie, Pa.—John L. Schwab, Manager, New England Div., Methods Engineering Council, of Bridgeport, Conn., addressed Erie Chapter at a dinner meeting November 4 in the General Electric Community Center.

His lecture, "Methods in Engineering," was followed by a discussion period.

Mathew Hetzel, Chapter Chairman, presided and presented the speaker. During the year, Mr. Hetzel announced, membership has increased from 76 to 91.

Obituaries—

Leslie A. Goff

Leslie A. Goff, 53, Equipment Engineer of Norton Co. and Past Chairman of Worcester Chapter, ASTE, died October 9 at Wilton, Conn., while on vacation.

Mr. Goff was born in Pawtucket, R. I., and lived in Worcester, Mass., for 21 years, where he was connected with Norton Co. in various capacities.

He was a member of the Mariesville, R. I., Lodge, A. F. & A. M., Royal Arch Chapter, Worcester County Commandery, Worcester Lodge of Perfection, Goddard Council, Prince of Jerusalem, Rose Croix, Master Consistory of Boston and Aleppo Temple of the Shrine.

He was also a member of the Norton Foremen's Club.

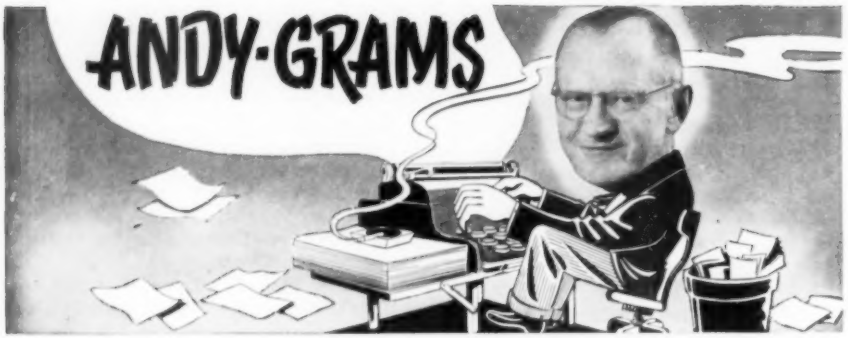
* * *

Emil M. Endruschat

Emil M. Endruschat, 50, veteran tool and die maker at A. O. Smith Corp., Milwaukee, Wis., died suddenly October 29 following a heart attack.

Born at Rucken, Germany, Mr. Endruschat graduated from college at Essen in his native land.

He had been employed at the Smith company since 1925 and became a citizen of the United States five years later. He was a member of the ASTE Chapter in his adopted city.



Like most lazy people, I like to be relieved of my chores, especially when the other guy can do a better job. So now, I am bringing a "guest artist" into the Column, an erudite gentleman who, as you will see, has gone clear back into Genesis to search out the first tool engineer. I therefore take pleasure in introducing (to readers of the Column) our popular Vice Prex from up Montreal way—Mr. Rob't B. (Bob) Douglas!

The "First" Tool Engineer

By Robt. B. Douglas

I take mild exception to the claims that Eli Whitney, famed as the inventor of the cotton gin, may be considered as the first tool engineer. In the cavalcade of tool engineers, Mr. Eli Whitney is very much of a Johnny-come-lately. Let us bow to his genius; let us acknowledge his extraordinary contribution to interchangeability in complex mechanisms; but, let us not call him Father. The Art and Science of Tool Engineering has deeper roots than the nineteenth century.

The Father of Tool Engineerng was born just eight generations out of Eden in the Ante-Diluvian night. Scholars put his birth at 1058 years after the advent of the first man. He was the son of Lamech, and the grandson of Methusaleh, and his name was Tubalcain. We can read his brief but eloquent biographical sketch in Genesis IV, 22: ". . . Tubalcain, an instructor of every artificer in brass and iron." In other words, the Father of Tool Engineers and Tool Engineering Education.

"There were giants in the earth in those days."

Project your mind back, if you can, to the conditions of the times. Lamech, crude, cruel, lusting son of Cain, was a mighty hunter and a mighty warrior. But his scope was limited. The old man was so taken-up with the day-to-day tasks of protecting the family and homestead against the depredations of rival families and wild beasts, that there was no progress and but little feeling of security in the family. The oldest son was a musician and the other a singing cowboy.

Then, came Tubalcain, son of the practical mother Zillah. Watching his father hunt with rough but precious weapons, he realized how tenuous was the claim to survival of the whole tribe, should ill-fortune break or carry off one of the few miserable spears or arrows in the side of a wounded lion. The family was left defenceless for days while a new one was painstakingly fashioned out of stone by hand methods. The herds were neglected, the music was stilled, while everyone pitched in to make a new supply.

The key to survival was production. Only with a large and assured supply of weapons could the family maintain the unrelenting struggle against its environment. Stop or threaten that supply and not only the arts of his brother Jubal, but food itself must be rationed or cut off altogether until the deficiency was made up. So little Tubalcain, while hardly more than a boy, studied the problem of production. From Foundry and Forge to finish grind, he studied and experimented with the processes of forming and shaping metal.

When one process had been mastered, he lost no time in breaking in a couple of slaves to keep production rolling, while he went on to pioneer the next step. Thus, was the principle of "The Division of Labour" first applied. The same techniques that made arrowheads were gradually applied to spears, knives and short swords. A continuous flow of weapons came from the production lines out behind old Lamech's hut. Behind this wall of weapons in the field, Jabal's commerce, and Jubal's cultural arts were free to flourish, and in Lamech's yard, the music of Tubalcain's Forge made fitting background for the melody of Jubal's oaten pipes.

But, restless Tubalcain must needs press on if the future be secured. The discovery of the techniques must be formulated into an organized body of knowledge, certain theories drawn, and principles laid down for the guidance of others. Tool Engineering as a formal science was conceived and born in the wilderness in the land of Nod.

The safety of the tribe, the advancement of science, the encouragement of commerce and the arts, in short, the upward progress of mankind, could not be secured and consolidated, if these secrets were left to rust and grow stale in the mind of one man. So Tubalcain called them all in—his brothers and his cousins and their slaves and their children—and he taught them those things which he knew and they laboured together each according to his abilities and his industry.

As great as had been his contribution in the perfection of technique, greater still was his vision of "The free interchange of scientific Knowledge." W[illegible]n the critical shortage of arms had [illegible]n changed to an abounding surplus, t[illegible]ir lines were converted to the implem[illegible]ts of peace, to the production of b[illegible]s bowls and lamps and great was the l[illegible]t and prosperity that settled on the l[illegible]d.

Unfortunately, with the great flo[illegible]s that were sent, after his death, to clea[illegible]e the world, were washed away both [illegible]e tools and the memory of Tubalca[illegible]'s works. To Eli Whitney and the fam[illegible]s Tool Engineers that have followed h[illegible]n has been given once more the k[illegible]y gradually to unlock the door of th[illegible]t Golden Science once put into the hand[illegible]s of Tubalcain in his youth. As later children of their heritage, let us honour Father Tubalcain's memory and cherish his dream.

Well, gentle readers, there you are! Personally, I always thought that the dwarfs who hammered out tools up in the caves of Ultima Thule (poetic name of the jumping off place I came from) were the first tool engineers. Remember how the god Loki used to kibitz 'em until they turned 'emselves into gadflies and chased him out? But, let's not quibble over technicalities. What I'd like to know is: Who made the hammers, tongs and anvils that Tubalcain hammered out his tools on?

From a member out Indianaway, a letter protesting the archaic and "vulgar" nomenclatures for tools, used in engineering offices and shops. Since they may come readily to mind—at least for old timers—there is no need to repeat these terms, some of which are frankly "salty"—and, it may be added, pat to the occasion at times.

However, many of these terms came into usage when terse Anglo-Saxon words were the rule rather than the exception and so were considered acceptable in good society. (They've been considerably expanded on in modern cafe society.) And, were we to delete them entirely from our vocabulary we'd have to expurgate Shakespeare, Bishop Percy, the dictionaries and a raft of literature including the world's Best Seller. But as for that, I've run across very few men who have associated these terms with smut, any more than with similar words used in our best literature. Like the Knights of the Garter: *"Honi soit qui mal y pense."*

The main point of objection, in my opinion, is that they are often misleading and confusing and therefore, have been superseded by more descriptive terms. For instance, we now apply the terms "internal" and "external" to threads and gages instead of the older terms, and the later nomenclatures really mean something. On these grounds, the point may be well taken.

ASTEely Yours,

Andy

GOOD READING

A Guide to Significant Books and Pamphlets of Interest to Tool Engineers

POWDER METALLURGY, by *Dr. Paul Schwarzkopf* (in collaboration with Drs. C. G. Goetzel, Robert Steinitz, and Werner Leszynski, and with George Stern), makes its appearance at an opportune time—when increasing interest is being directed to the industrial processing of metal powders. Not written in the conventional textbook style, "Powder Metallurgy" represents the revised workbook and notebook of an eminent and successful powder metallurgist.

Dr. Schwarzkopf should be well known to every engineer, since he has been a true pioneer in this field and remains in the forefront of those exploring its future. He holds many patents and may be best known as the inventor of the multi-carbide hard metals. Founder and head of the American Electro Metal Corporation, Dr. Schwarzkopf and his associates are now engaged in the development of materials for use at high temperatures—essential for jet propulsion, gas turbines, and other projects of today's and tomorrow's industry.

The body of the book is divided roughly into four divisions—Processing, Products, Theoretical Principles, and Future Developments. The first section describes the various metal powders in general, their characteristics, preparation, and treatment. Next in line is powder metallurgic processing—compacting and sintering. Information essential to the correlation of powder characteristics with compacting and sintering is included.

Thorough study is given to the development, theory, manufacture, and commercial applications of various groups of materials, and to the requirements of certain groups of products—Dense Materials, Porous Products, Refractory Metals, Hard Metals, Electric Contact Materials, Magnetic Materials, and Friction Parts.

Other subjects are the development of theoretical concepts, the mechanical strength and ductility of sintered metals, and diffusion in solid solutions.

Each section is followed by an exhaustive bibliography of books, papers, and patents; and, each section is supplemented by a review of the more recent developments that have appeared since completion of the original manuscript. The text, throughout, is profusely illustrated and clarified by charts, tables, drawings, and photos.

Here is provided an authoritative source of information on the possibilities of powder metallurgy for engineers in many fields. It is available at $8.00 per copy from *The Macmillan Company*, College Dep't., 60 Fifth Avenue, New York, N. Y.

PRECISION HOLE LOCATION for Interchangeability in Toolmaking and Production, by **J. Robert Moore**, has gone into its second printing of 5,000 copies. In addition to wide use in toolrooms and machine shops, the book has become a standard text in engineering courses at a number of colleges, as well as in numerous apprenticeship courses.

"Precision Hole Location", which has 448 pages and over 400 illustrations, is a comprehensive review of all hole-location practices and their evolution to the point where the toolmaker can now employ engineered methods and apply the principle of interchangeability to his own operations.

The book is available from the *Moore Special Tool Company*, Bridgeport, Conn. It is sold within the metal-working industry at $3, or $3.50 abroad.

HANDBOOK AND INSTRUCTION MANUAL, No. 39271, is devoted to gasoline injection systems for light aircraft. While principally covering the operation, maintenance, and service of Ex-Cell-O Models B4 and B6 systems, the booklet does contain a handbook section including much data which will be useful to engineers engaged in the design, manufacture, and sale of spark-ignited internal combustion engines.

This paper-bound booklet may be had, at $1.00 per copy, from *Ex-Cell-O Corporation*, Fuel Injection Div'n, 1200 Oakman Blvd., Detroit 6.

WEAR AND SURFACE FINISH, by **E. L. Hemingway**, Research Engineer, covers the basic reasons for surface wear and its relation to surface finishing. Both the measurement of surface roughness and its correction by Superfinishing are included.

The controversial subject of when to use a scratch pattern and when to use an ultra smooth finish is discussed in detail.

This 80-page paper-bound text is available, free of charge, from the *Gisholt Machine Co.*, Madison, Wisc.

HOW TO RUN A LATHE, 45th Edition, is now available and incorporates a number of changes since the previous edition was printed in 1944.

This manual includes such subjects as the operation of lathe units, taper turning, tapping, cutting screw threads, reference tables, and many others. The present edition has 128 pages, and more than 365 illustrations.

Copies are available with paper cover at 25c, or with leatherette cover at $1.00, from *South Bend Lathe Works*, 417 E. Madison St., So. Bend 22, Ind.

PRINTED CIRCUIT TECHNIQUES, by **Drs. Cledo Brunetti** and **R. W. Curtis**, of the National Bureau of Standards, is the first comprehensive treatment of the various methods of "printing" electronic circuits.

The methods of applying wiring and circuit components directly to an insulated surface, thus combining ruggedness with a high degree of miniaturization, are presented as Painting, Spraying, Chemical Deposition, Vacuum Processes, Die-Stamping, and Dusting. Performance and application details as well as precautions and limitations are included.

By means of the printing process, the conventional electronic circuit—a maze of wires and other elements—is replaced by a compact circuit printed on a small flat plate, eliminating much of the third dimension.

This invaluable booklet is listed as NBS Circular 468 and is procurable at 25c per copy from the Sup't of Documents, *U. S. Government Printing Office*, Washington 25, D. C.

MAINSPRING, the Story of Human Progress and How Not to Prevent It, by **Henry Grady Weaver**, is based on the general theme of Rose Wilder Lane's book "The Discovery of Freedom." While not an engineering book, "Mainspring" holds much import for the engineer.

"For sixty known centuries . . . Earth has been inhabited by human beings not basically different from ourselves. Their desire to live has been just as strong as ours. They have had as much physical energy as the average person of today and among them have been men and women of great intelligence. *But for six thousand years, most human beings have gone hungry.*

"Countless millions . . . have died young, in misery and squalor, and still do over most of this earth. Why have men died of hunger for six thousand years? *Why don't we?*

"What has been responsible for the unprecedented burst of progress which has so quickly transformed a hostile wilderness into the most prosperous and advanced country in the world?"

After eliminating all other factors, the answer is found to be "because each person has had freedom of opportunity to apply his energy, imagination, and inventive ability to the creation of new things—with the chance of sharing in the fruits of his extra effort."

"Mainspring" is a new kind of book—a streamlined story—maximum information with minimum reading time, plus an unusual entertainment value. It may be ordered from *Talbot Books*, 6432 Cass Ave., Detroit 2, at $1.00 ea.

North East West South in Industry

The Bullard Co., machine tool builders, Bridgeport, Conn., has appointed **LOUIS J. BAUDIS**, formerly development eng'r, as Chief Eng'r; also, **ROBERT W. WARING**, who had been with Bridgeport Brass and Sperry Gyroscope, as Asst. Chief Eng'r, and **JOSEPH C. OLSON**, formerly head of Tool Control Div'n, as head of Service and Demonstration.

Strong, Carlisle & Hammond Co., mill supply firm, Cleveland, O., announces retirement of **GEORGE J. ZIMMERMAN** as Pres. and as Mgr. of Machinery Div'n, after more than 46 years of service. His assistant, **EDWARD L. MACK**, will succeed as manager of the Div'n, with the new president to be announced later. **HARRY H. SMITH**, retiring as Mgr. of the Mac-it Div'n, will be succeeded by his ass't, **STANTON C. GUNNETT**.

Lovejoy Tool Co., Inc., mfr. of metal cutting tools, announces **BURLEIGH-STOCKER MACH. CO**, 23675 Woodward Ave., Pleasant Ridge, Mich., as representative in Eastern Michigan.

Axelson Mfg. Co. announces resignation of **GEORGE H. LYNN** from the field sales staff. Mr. Lynn will be associated with **Niles Tool Works** as Western Div'n Sales Mgr., with offices at Chicago.

Kennametal, Inc., mfr. of cemented carbide tools, has named **K. W. JONVIK**, Dronningens gt. 17, Oslo, Norway, as representative.

THE HUNT-JORDAN CO. has been organized, with offices at 1147 S. Independence Blvd., Chicago 24, to be exclusive representative in No. Illinois and part of Iowa and Indiana for **Progressive Welder Co.**'s line of resistance welding equipment. Principals in the new firm, which will also handle **Knu-Vise** toggle clamps in the same territory, are **DONALD F. HUNT**, associated with Progressive sales and service for a number of years, and **W. H. JORDAN**, who has been in charge of standard machine design at Progressive.

E. W. Bliss Co. has named **FRANCES J. SELN**, formerly Ass't Master Mechanic, as Sales Eng'r to service stamping manufacturers in the Detroit area.

The National Supply Co. announces transfer of **LLOYD H. HARRIS**, diesel engine specialist, from the company's Superior Engine Div'n to the Plant Products Div'n to handle sales and service of Superior engines, in all branches of the oil industry, with offices at Houston, Tex.

Allis-Chalmers Industrial Sales Dep't announces that **L. F. McCAFFREY**, special eng'r for the metal industries, is now located at the Pittsburgh district office.

THE INDEX MACHINE CO., Jackson, Mich., has been formed to be nat'l sales representative for the **Index Machine and Tool Co.** of the same city. The firm will handle the complete line of Index Milling Machines and related equipment formerly sold through **Blank and Buxton Mach. Co.**

CHARLES J. KOLB, who has an outstanding record in personnel and employee relations work, is the new Manager of Industrial Relations of **Niagara Machine & Tool Works**, Buffalo, N. Y.

The Gray Iron Div'n of **American Foundrymen's Ass'n** has elected **R. G. McELWEE**, executive of Vanadium Corp'n of America, Detroit, as Chr.

R. S. NEBLETT, Mgr. for two years of Federal and Marine Div'ns, **General Electric Co.**, has been named Administrator of the company's Nucleonics Project, which consists of work on atomic energy for the U. S. Atomic Energy Commission. **FRANK T. LEWIS** has been appointed Ass't Mgr. of GE's Schenectady Works, and **C. H. LINDER**, Ass't Mgr. of Mfg., Apparatus Dep't.

DUAL PRESS CO., St. Louis, Mo., has appointed **Machinery & Welder Corp'n**, St. Louis, as national wholesale distributors for sales and service of the all-steel Dual Brake Presses.

Pratt & Whitney, Div'n Niles-Bement-Pond Co., West Hartford, Conn., has taken over the manufacture of products of the **MAGNETIC GAGE CO.**, Akron, Ohio. This line includes continuous electrical gages for rolling mills, strip mills, and paper mills.

Dr. Keith Van Allyn, who has completed a 15-year research project for the Nat'l Inst. of Vocational Research, Inc., announces the formation of **SURVEYS, INC.**, at Palo Alto, Cal., to make available to educational and industrial organizations the most recently developed and scientific placement techniques, training service, job evaluation methods, and special economic surveys. Associated with the new firm is **J. Herman Mattson**, also well known in the industrial relations field.

Recent elections at **The Yale & Towne Mfg. Co.** include **CALVERT CAREY**, Pres., and **FRED DUNNING**, Exec. Vice-Pres.

THE ARTER GRINDING MACHINE CO., Worcester, Mass., has purchased from **The Grenby Mfg. Co.**, Plainville, Conn., the rights to manufacture and sell the line of cylindrical and internal grinders previously made by that firm.

The ARSENEAU-PRICE CO. has been organized, with offices at 10840 E. Warren Ave., Detroit 13, to manufacture a complete line of standard straight shank chucking reamers—straight and spiral flute from $\frac{1}{8}$" to $\frac{1}{2}$" dia. inclusive—and special reamers, end mills, milling cutters, and counterbores.

Charles G. McGill, who has been associated with the tungsten carbide tool industry since its inception, has announced formation of the **McGILL CARBIDE TOOL CO.**, with offices at 4612 Woodward Ave., Detroit 1.

REPS TOOL CO., INC., mfr. of pipe and stud extractors, formerly of New York City, is now located in Hartford, Conn.

YODER DIE CASTING, INC. has opened a new plant at 727 Kiser St., Dayton, O., in order to increase Yoder aluminum and zinc die casting facilities.

Heli-Coil Corp'n is the new name of **AIRCRAFT SCREW PRODUCTS CO., INC.**, Long Island City, N. Y., and was adopted because of the firm's products having so many applications outside of the aircraft industry, particularly the Heli-Coil Screw Thread Inserts, its principal product.

HENRY D. SHARPE, Pres. of **Brown & Sharpe Mfg. Co.**, has resigned his duties as Treasurer, and **FREDERICK P. AUSTIN, JR.**, Ass't Treas., since 1941, was elected to position of Vice-Pres. and Treas.

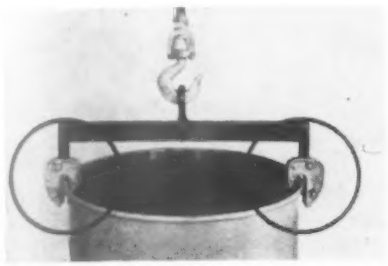
Associated Locksmiths of California have presented to the **Stamford Div'n, THE YALE & TOWNE MFG. CO.**, a certificate of merit for outstanding achievement in product design.

All systems of Materials Handling will be represented at the Second Annual **NATIONAL MATERIALS HANDLING EXPOSITION**, to be held in the Public Auditorium, Cleveland, O., Jan. 12-16 inclusive. This show, which was originally scheduled for 4 days, will now run for 5 days. Running concurrently with the Show will be educational features to include a conference on Materials Handling and various films on handling subjects. **Edwin J. Heimer**, Pres. of Barrett-Cravens Co., Chicago, is Chairman of the Exposition Committee.

TOOLS OF TODAY

Notice: Readers who desire additional information on Tools of Today and other current reference material, are referred to the Tool Engineer's Service Bureau, located in the advertising section of THE TOOL ENGINEER. See pages 96-97.

"Twin" Barrel Lifter



Designed to lift a barrel straight up, and safely, a new **BARREL LIFTER**, by *Merrill Brothers*, employs a dual adaption of the Volz clamp to provide a position that lightens with increased load. The clamps can be instantly attached and detached from the barrel, which thereby becomes a convenient agent for materials storage and handling. **T-1-1**

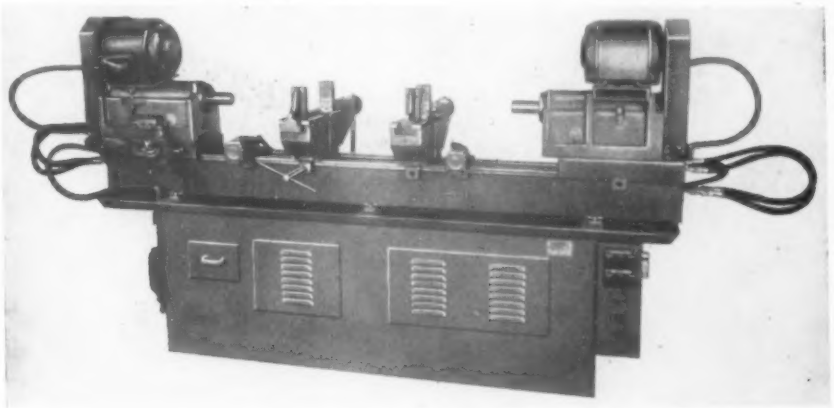
Elevating Table

Designed to safely lift and carry loads up to one ton, a portable **ELEVATING TABLE**, by *Montgomery & Co., Inc.*, is adjustable vertically from 26 to 43 inches over floor. With table top 20 x 32 inches, the unit permits one man to move heavy dies from storage to presses, or for moving dies to and from presses at identical levels; also, for support of overhanging work on drill presses or other machines, or for transfer work and other handling. **T-1-2**

New Centering Machine

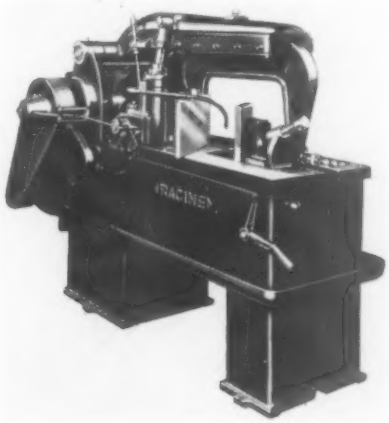
A hydromatically operated **CENTERING MACHINE**, by *Hebert Equipment Company*, is readily adaptable to a wide range of centering work, whether for short run or mass production.

A "first operation" machine, with ball dimensions over centers held plus or minus .0005", the several exclusive features of this double-end tool includes automatic cycle-rapid approach, drill, dwell (electrically adjustable) and automatic rapid return to provide maximum per hour production with a minimum of operator fatigue. No hand operation of vise or heads is required and, using standard jaws, locators and stops, the machine is quickly changed to suit a wide variety of diameters and lengths. **T-1-3**



Metal Cutting Machine

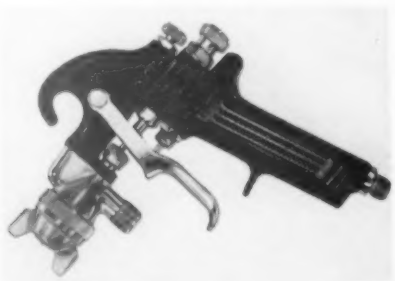
A new "Oil Cut" Model, fully hydraulic **METAL CUTTING SAW**, announced by *Racine Tool & Machine Company* of Racine, Wisconsin, provides metal working shops with a low priced modern, fully hydraulic cut-off saw for all types of metal in all sizes up to 10" x 10".



Feed and pressure control, rapid traverse and the lift on the non-cutting stroke are all hydraulically operated. A single lever located at the front of the machine regulates rapid traverse and clutch. A push-pull lever allows a gradual lowering of the frame and blade for measuring the cut-off lengths of stock. **T-1-4**

Production Spray Gun

A new high precision production **SPRAY GUN**—the model 18—announced by the *Binks Manufacturing Company*, is designed to handle all types of finishes except ceramics, for which the Model 18V is offered. The latter has tungsten carbide inserts in the material nozzle and needle valve to take the wear of abrasive materials.



The controls of the Model 18 are conveniently located at the back of the gun, with the spray pattern adjustable from round to flat with all intermediate patterns. The body is of drop-forged aluminum, with black electrolytic coating for long life surface protection, and the head and air nozzle are of tough, drop-forged bronze with exceptionally heavy plating.

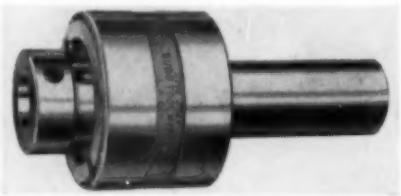
The material nozzle is of hardened steel, and a hardened steel needle valve is easily adjustable to compensate for wear. **T-1-5**

Hi-Lift Truck

Pictured is a new **LIFTING TRUCK**, by the *Automatic Transportation Company* (Div'n of Yale & Towne Mfg. Co.), which is said to offer heights not previously achieved by trucks of its capacity.

With a standard collapsed height of 83 inches, the four, five and six-thousand pound models will lift to 124", and the seven and eight thousand pound models will lift to 115 inches. Forks and uprights are raised independently, by hydraulic lift telescope action, enabling tiering under ceilings as low as 84 inches. Brawny design features high-pressure hydraulics, producing greater efficiency with smaller and lighter trucks, and the Newmatic controller, which functions as the electric counterpart of automotive automatic gearshift. **T-1-6**

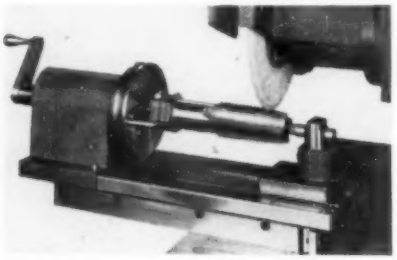
Pull-Out Tap Holder



A new "Tool-Flex" Neoprene Mounted Non-Releasing, Pull-out Type **FLOATING TAP HOLDER**, by *Burg Tool Manufacturing Company*, is designed to prevent binding and to absorb shocks when tapping on screw machines. The floating feature assures alignment with drilled holes, reducing if not entirely preventing tap breakage due to misalignment. The pull-out action compensates for difference in cam motion and tap travel when backing out. **T-1-7**

Thread Grinding Attachment

A simple and novel **THREAD GRINDER**, by *Tinker's Thread Grinder Co.*, can be mounted as an attachment, on any standard make surface grinder, for accurate grinding of taps or threaded workpieces. Light and compact, and measuring 4-9/16" wide x 6" high, the tool can be steadily held on a magnetic chuck.



Essentially, the tool consists of a base plate, a head-stock incorporating a hand cranked lead screw, and a tail-stock, the latter adjustable vertically to compensate for errors in work for grinding tapers. A 4 inch sine bar, on the end of the base, is used to set the helix angle of a thread. With a specially made lead screw and nut the total can be adapted to grinding circular cutters requiring radial relief; also, by use of a straight shaft and cam, in place of the lead screw, it can be used to back off taps, counterbores and special cutters, provided that these have center holes. **T-1-8**

Industrial Truck Chargers

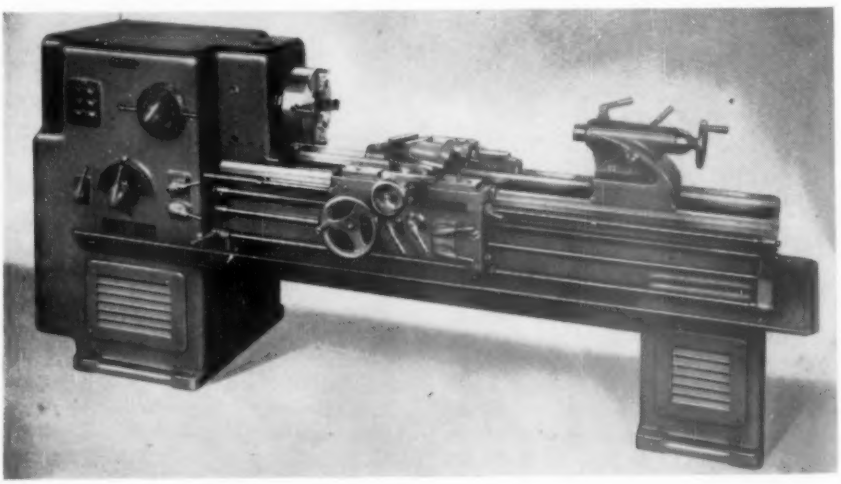
Among exhibits at the National Materials Handling Exposition will be a line of **CHARGERS**, for industrial truck batteries, by the *Westinghouse Electric Corporation*. The Rectox chargers, shown, and now available for lead-acid or nickel-alkaline batteries, utilize the copper-oxide plate rectifiers that have been proven dependable through 16 years of service. The Rectox two-rate charger, operating on 230 or 460 volt 3-phase 60 cycle power supply, is designed to charge lead-acid type batteries, 12 to 24 cells, 190-700 amp. hr. capacity, in 8 hours. **T-1-9**

New Toolroom Lathe

A new **TOOL ROOM LATHE**, by the *Sidney Machine Tool Company*, features a 32-speed, pre-selective dial controlled, all herringbone geared headstock. The gear box is totally enclosed, with all moving parts running in oil, and 60 changes of feeds, from .0028" to .174, and 60 changes of threads, from 1-12 to 92, are available by means of the dial control.

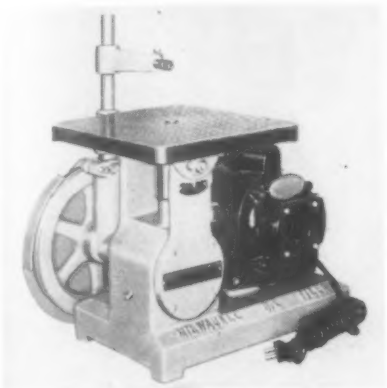
The tailstock, in turn, is provided with a direct length reading dial to indicate longitudinal movement of the spindle. The dial can be easily set to zero, for convenience in drilling blind holes, and an index line indicates spindle center line. The front of the tailstock spindle is beveled at 30° for setting threading tools.

The bed, cast of a steel-nickel-grey iron mixture, is designed with four longitudinal walls and double cross girts spaced at 12" intervals. The heavy duty apron is of double wall construction, with all shafts rotating in anti-friction bearings. Cross and longitudinal feed is through positive clutches, and all moving parts in the apron, including the lead screw, are automatically lubricated from a centrally located pump and reservoir. **T-1-10**



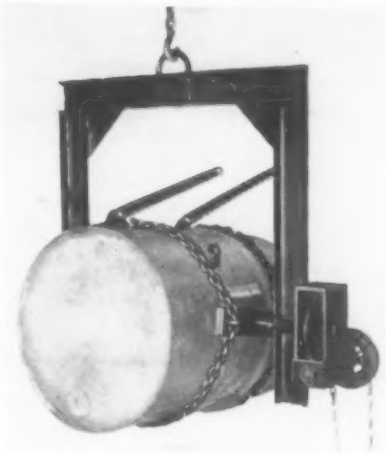
New Milwaukee Die Filer

Redesigned to provide definite operating advantages, the new model bench-type reciprocal **DIE FILER**, by *Milwaukee Chaplet & Mfg. Co.*, now has a 6-way tilting table, up to 15° in any direction; this feature, together with serrated surface, permits of a much wider range of filing, sawing and lapping operations with a surface free from chips which might interfere with smooth operation.



Also, a new universal chuck permits adjustment to compensate for crooked or warped shanks on files or lapping stones and assures true perpendicular movement and straight-line, flat-surface cutting action. Also added is a safety belt guard, formerly available as an accessory at extra cost. **T-1-11**

Drum and Barrel Tilt

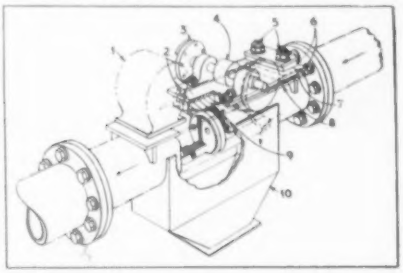


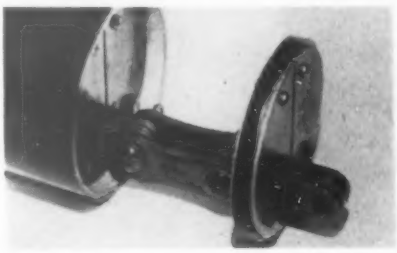
Designed to simplify materials handling and eliminate hand dumping, a new **DRUM AND BARREL TILT**, by the *Palmer-Shile Company*, is a time-saver for controlled dumping of chemicals, plastics, molding powder, and divers liquids and crap solids. The standard unit, which is of heavy welded steel construction and equipped with two safety locking devices, is 1000 lb. capacity for 55 gallon drum or barrel, which can be turned full 360 degrees. The turning device incorporates the worm drive principle and is available in hand chain models. **T-1-12**

Unbalanced Load Vibrator

A new unbalanced load **VIBRATOR** is presented by *Hapman Conveyors, Inc.*, as an accessory to their rubber flighted sealed pin chain pipe conveyors. Vibration is delivered directly to rubber flight through a hole in the pipe and base and, since the impact bar strikes only the rubber portion of the flight, the whole is practically noiseless.

The principle is schematically shown in the line drawing, in which the various components are numbered, viz: 1, the motor; 2, V-belt drive; 3, adjustable unbalance load; 4, fixed unbalance load; 5, sandwich tension control; 6, rubber sandwich; 7, oscillating plate, and 8, the fixed base plate. At 9, the knocker strikes conveyor rubber flight through slot in pipe and base, or through the pipe seal rubber cover.





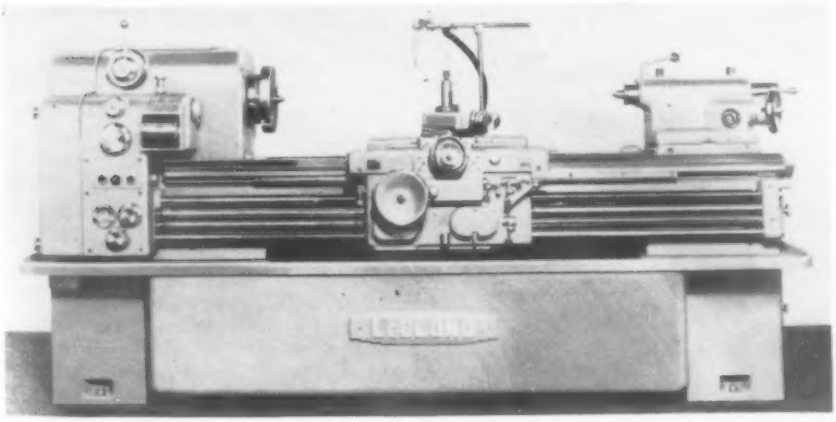
Shown in the photograph is the new Hapman standard all round synthetic **RUBBER FLIGHT**, mounted on sealed pin chains and designed to convey a variety of materials—coal, cement, flour and so on—through 3″ to 10″ pipes, or along semi-circular trough sections. **T-1-14**

LeBlond Tool Room Lathe

A new 16″ **TOOL ROOM LATHE**, by the *R. K. LeBlond Machine Tool Company*, includes an unusually wide range of spindle speeds and increased ease of operation as its outstanding features. More than 100 spindle speeds, in each of three ranges totaling 300 speeds ranging from 6 to 1500 rpm, may be obtained without stopping the spindle. Speed is controlled by an ingenious speed adjuster unit which permits faster operation with commensurate reduction in operator fatigue.

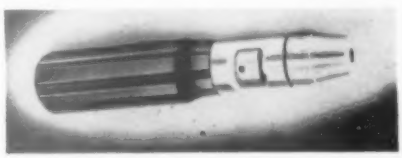
Carriage, cross slide and tailstock are moved by a rapid traverse, and lubrication of these units, as well as of the apron, is entirely automatic. Providing for greater convenience is an offset tailstock wheel, far easier to manipulate than the conventional in-line wheel. This construction, together with worm and rack movement, and a "thrustlock", permits full-length bearing, with longer travel, for the tailstock spindle.

Additional and entirely new lathe features include a combination gear-belt drive headstock and a combined feed apron which has special arrangement for connecting length and cross feeds for cutting steep tapers in connection with a geared type, taper attachment. These, and many other features, together with in-built precision throughout, adapts the lathe to an unusually wide range of tool room work. **T-1-13**



"Trutorq" Screw Driver

A new model Trutorq **POWER SCREW DRIVER**—CSD-15—by *Airdraulics Engineering, Inc.*, incorporates a calibrated head which may be quickly set to any desired torque from 1 to 15 inch-pounds without aid of other calibrating devices.



The tool, which operates on a highly accurate friction vise principle, has a cast aluminum body and a specially designed handle of only ⅞″ diameter. Its small size and light weight—3½ oz.—together with ease of handling naturally reduces fatigue or repetitive screw driving. **T-1-15**

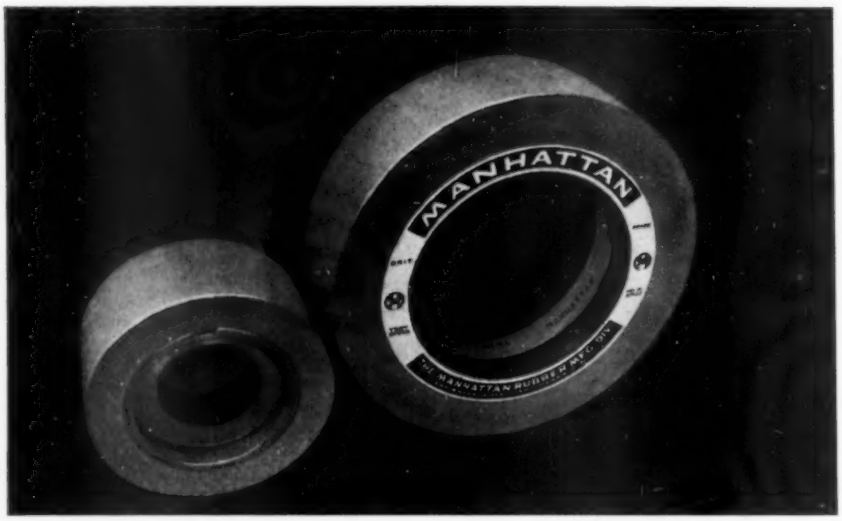
Temperature Control Unit

A **TEMPERATURE CONTROL UNIT** for coolants, by *Niagara Blower Company*, eliminates warm-up operations and subsequent tool adjustment, as well as variations in machine work caused by temperature rise during operations.

While here shown in combination with a New Britain-Gridley automatic, the unit can be adapted to all multi-spindle automatics as well as to other equipment whose service would be improved by consistent temperature control.

Fall in temperature is prevented by the automatic operation of an electric element, and whether a machine is running continuously or intermittently, the temperature of the coolant is maintained within a few degrees. **T-1-16**

MANHATTAN RUBBER BONDED CENTERLESS WHEELS



HEAVY STOCK REMOVAL—ROUGH and FINISH with same wheel

Data from Test Files and Engineering Reports—Thru-Feed with 20"x6"x12" Wheels

Material	Hardened Steel Pins	Stainless Steel Bars	Soft Steel Bars	Shelby Tubing	Cast Iron Rolls
Size	¼" to 1" dia. 4" to 6" long	.040/.400" dia. Mill lengths	⅜" to ⅝" dia. 10' to 20' long	1½" dia. 3' to 5' long	⅝" to ¾" dia. 4" to 8" long
Passes and Removal	3 Passes 1st .006/.008 2nd .0035 3rd .0015	2 Passes 1st .010/.012 2nd .002/.003	2 Passes 1st .021/.023 2nd .005/.007	3 Passes 1st .005/.006 2nd .003/.004 3rd .002	2 Passes 1st to .070 2nd to .011
Hold Size	+.0001 −.0000	.0015 Taper 12' Bars	Very Well	Good	Good
Finish	Excellent	1st Pass Commercial 2nd Pass Polish	Good Commercial	Very Good	Fair
Specifications	4660 F15 KLE	80100 Q52 BV5	4660 FS8 BV9	6080 Q85 KLE	3646 FS78 KLe

REGULATING WHEELS—PLAIN—CORE MOUNTED
MANHATTAN CORE MOUNTINGS EFFECT SUBSTANTIAL SAVINGS

RAYBESTOS-MANHATTAN INC.

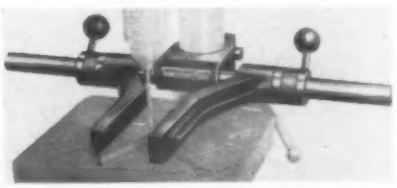
Keep Ahead with Manhattan

MANHATTAN RUBBER DIVISION PASSAIC, NEW JERSEY

Precision Tapping Tool

An easy-to-use precision Hand **TAPPING** and **THREADING MACHINE**, by the *Farmington Tool & Mfg. Co.*, is designed for either internal or external threading and is equally suited to tool room, experimental shop or short run production uses. The ground spindle turns in an extra long turning, insuring long life and maintained accuracy; this accuracy, together with the fact that the threading tools are fed straight down, prevents misalignment and consequent spoilage.

A big machine, as hand tappers go, it will thread a tap to center of 24" work, while height from chuck to table is 11½". 12 collets, in increments of 1/16", provide tapping capacity from 3/16" to 1" and an adapter, for dies, permits external threading in any capacity up to 1". The machine comes complete with collets and accessories in a compact kit. **T-1-17**



Safety Work Holder

By replacing makeshift devices, a new **WORK HOLDER**, by *Universal Vise & Tool Company*, enhances safety and, as a result, increases accuracy and output. The tool, which clamps to the column of any standard small drill press, incorporates clamping arms that, in addition to being quickly adjustable along the length of the cross arm, can be as quickly swung back clear of the drill press table. The clamping arms, which may be quickly adjusted to work, require only a quarter turn to tighten. **T-1-18**

Center-Control Fork Truck

A new Type FQH-10 center-control FORK TRUCK, of which the initial model was developed about four years ago, is announced by the Baker Industrial Truck Division of the *Baker-Raulang Company*. After exhaustive tests, a pilot model of the new truck has been built and quantity production has been started for delivery in March, 1948.

Weighing only 3800 lbs. with load, and designed to meet the need for a small, lightweight and low-priced truck of 1000 lbs. capacity, the FQH-10 will find application in plants where narrow aisles, congested areas, limited floor capacity, and small and low-capacity elevators are factors limiting loads to half ton capacity.

Only 28″ wide, the truck has a 36″ wheelbase and an overall length, exclusive of forks, of 53⅝″. Since it is designed for loads 30″ long, it requires only 67½″, plus the length of the load, to make a right-angle turn in 97½″. The travel controller provides three speeds forward, and reverse, with the circuit made and broken by a contactor which, interlocked with the controller, provides for starting in low speed only—a factor of safety for both personnel and material. When the driver lifts his foot from the treadle, to apply the brakes, the foot switch cuts off power and the motor. **T-1-19**

New Lubricating Compounds

A new series of lubricating componds, called **GLYCOLUBE** and manufactured by *Glyco Products Company, Inc.*, have been especially developed as modern lubricants for drawing, sheeting and stamping non-ferrous metals.

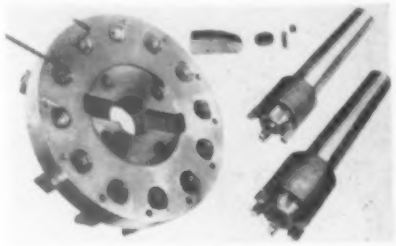
The Glycolubes are available in several forms ranging from liquids to solids and from water-soluble or water-dispersable materials to oil-soluble materials. One compound, in the series of 12, is both water and oil dispersable.

Automatically applying a film which acts as a temporary corrosion inhibitor and which permits continuous lubrication, Glycolubes are said to result in a brighter product and, since they do not break down during operations, there is no particular necessity for renewing the lubricant. **T-1-20**

Carbide Milling Cutters

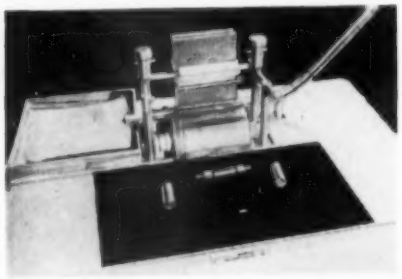
A newly developed line of **CARBIDE MILLING CUTTERS**, by the *H. T. Howald Machine Works*, includes End Mills from 1½″ to 3″ diameter, Shell Mills from 3″ to 6″ diameter, and Face Mills, for heavy duty, from 8⅜″ to 14″ diameter. The latter incorporates a "Cone Blade" lock, and the smaller cutters the "Sharp Blade" lock.

As the blades are of standard square stock without grooves or serrations, they may be ground to any combination of angles prior to inserting in the cutter heads, a feature that permits a minimum amount of stock to be removed when sharpening. If desired, blades of cast alloys or high speed steel may be used in place of the carbide tipped blades. The Replaceable Blade End Mills have 4 to 6 blades; the Shell Mills 6 to 12 blades, and the Face Mills 10 to 20 blades. **T-1-21**



Automatic Feed Attachment

Feeding, holding and ejecting are accomplished automatically in a new 4-vane **AUTOMATIC FEED ATTACHMENT**, developed by the *Size Control Div'n of* American Gage & Machine Co., for use with their Centerless Lapping Machines. After adjusting tension on the holding applicator, the operator is only required to load the feed chutes with parts to be lapped.



Cylindrical pieces, fed in between the lapping rolls, may be lapped to within 2 microinches as they move leftward across the rolls, to be ejected at the far end. Lapping pressure is determined by an adjustable spring tension, and a feature of the attachment is that, should one of the four vanes gum up with lapping compound, a clean vane can immediately be rotated into position.

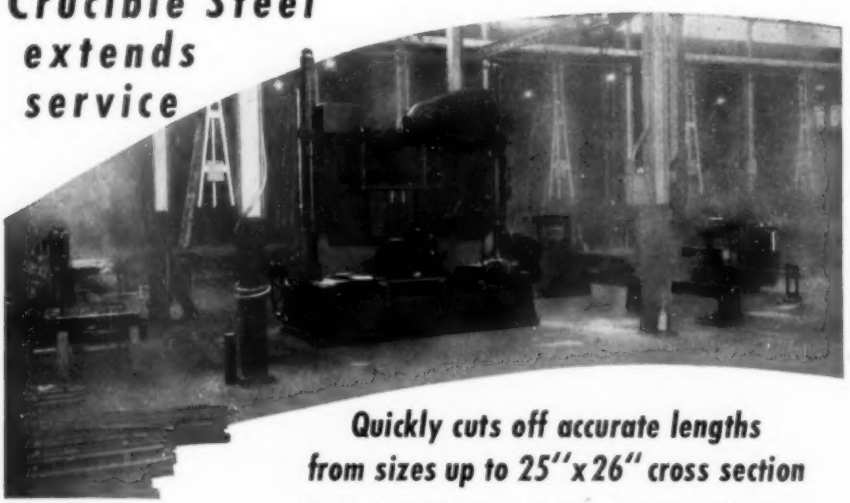
T-1-22

Aluminum Conveyor

A lightweight aluminum gravity **WHEEL-TYPE CONVEYOR**, by the *Rapids-Standard Company, Inc.*, is especially designed to provide an easy-to-handle type of conveyor for general use.

The aluminum frame channel is only 2½" deep, yet, tests have shown that an 8 ft. section will support distributed loads up to 2500 pounds. However, the standard rating per section, with ten ball-bearing wheels per foot, is 75 lbs. per foot, or 600 pounds per section. Because of the free running wheels, an incline of only 3 inches per 8 ft. section is required for free and smooth movement of materials. **T-1-23**

Crucible Steel extends service



Quickly cuts off accurate lengths from sizes up to 25"x26" cross section

The Crucible Steel Company of America with 26 branch warehouses and sales offices, has built a reputation for anticipating customers' needs, not only in high grade and special steels, but in service requirements as well. They were among the first to equip several of their warehouses with modern high speed MARVEL Saws (No. 6 and 9A series) in order to give fast service on either single lengths or large quantities of identical pieces, accurately cut from bars up to 10" x 10" cross section. Now in anticipation of new demands for larger sizes, they are the first steel company to install a No. 24 MARVEL Hydraulic Hack Saw in order to give fast service on orders for steels of any type in sizes up to 25" x 26" cross section.

This giant hack saw, which almost qualified as a "secret weapon" because it contributed so materially to our production capacity in building naval ordnance, applies an entirely new principle of reciprocation that has made "hacksawing" of large work practical for the first time.

Whatever your metal sawing problems, there is a MARVEL Saw exactly suited to your needs. A MARVEL field engineer will be glad to go over your metal sawing problems with you.

No. 24 MARVEL giant Hydraulic Hack Saw (capacity 24" x 24"). Employs new "Roll Stroke" sawing action and trouble-free low pressure hydraulic control.

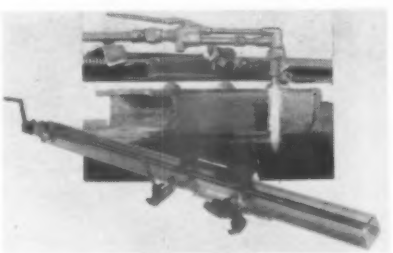
No. 9A MARVEL Production Saw (capacity 10" x 10"). Automatically feeds, measures and cuts-off identical lengths from single or nested bars with no more operator attention than an automatic screw machine.

No. 6 MARVEL Saw (capacity 6" x 6"). A high-speed, heavy-duty, all-ball-bearing saw—operates up to 149 strokes per minute, cuts thru 64% of each stroke, returns in 36%.

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 BLOOMINGDALE AVENUE, CHICAGO 39, U.S.A.

MARVEL SAWS

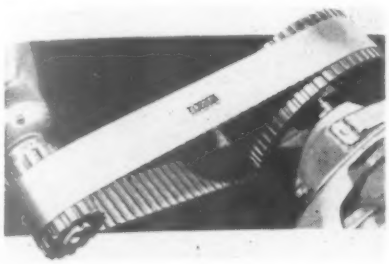
Portable Welding Feed



A portable **SCREW FEED**, developed by *J. A. Campbell Company*, holds a welding torch and provides feed in a straight line. By turning a crank at desired rate of feed, the torch cuts a straight line within the range of its 5 ft. length. The torch is kept at desired height, from the work, by means of a stainless steel wheel. **T-1-24**

Belt With "Teeth"

A new belt, with rubber teeth that will not slip, and announced by the L. H. Gilmer Division of *United States Rubber Company*, is said to be enormously strong, highly flexible and virtually noiseless in operation. Known as the **GILMER TIMING BELT** and designed for use on machinery equipped with special pulleys grooved to fit the teeth, the belt is reinforced with steel cables embedded in oil-resisting synthetic rubber.

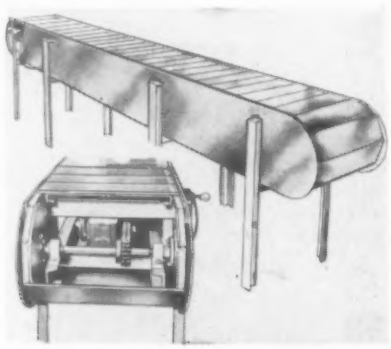


The cables reduce stretch almost to zero, eliminating the necessity of take-up devices installed on many belt drives to remove slack. In operation, the belt makes positive engagement with the pulleys at any speed, thus making it suitable for power transmission and synchronization. Wide usage is expected in the automotive and aviation fields and on machine tools, business machines and industrial equipment.

T-1-25

All-Aluminum Conveyor

A pre-fabricated, all-aluminum **BELT CONVEYOR**, by the *Patron Transmission Company*, is particularly suited for use in the food industries, as well as for assembly, receiving and shipping, and warehousing.



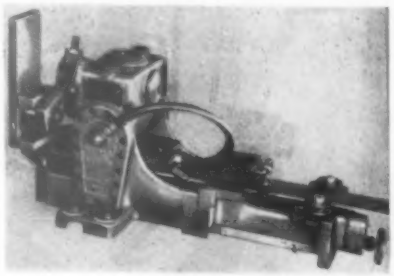
All components, such as chain, belt, sprocket and frame are of heat treated aluminum alloy, thus providing lightness with ample strength. The conveyor, which is available in widths 6" to 60", and heights from 15" up (36" is standard) is shipped prefabricated in sections that may be quickly assembled into one continuous unit up to 150 ft. in length.

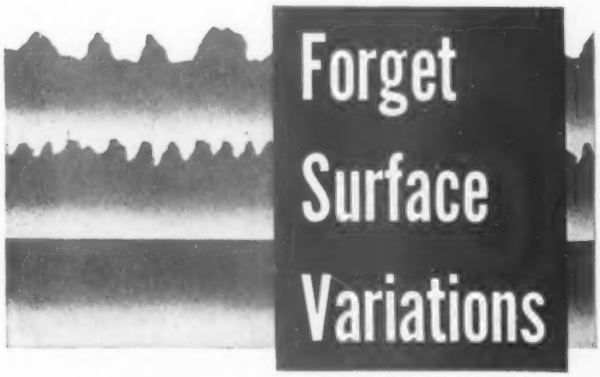
Load capacity is 250 lbs. per sq. ft.; pulling load 6100 lbs., and the conveyor may be run up to 100 f.p.m. Standard equipment includes speed reducer, drive, pillow blocks, take-ups, shafts and electric reversible control. Maximum temperature limit is 500°F. **T-1-26**

Hydraulic Stock Feed

A compact and entirely self-contained hydraulically-operated **STOCK FEED**, for use on almost any punch press, and announced by *Haller Machine & Mfg. Co., Inc.*, handles all stock up to 4" width and 3/32" thickness and feeds any desired length from 0" to 5", within .003" to .005". Dependable accuracy of feed saves stock, reduces down-time for die sharpening, and increases the service life of the dies.

Known as the Haller Model D-600 Hydraulic Stock Feed, the unit is mounted on the bolster plate of the press and can be located to feed the left, right, front or back. It is driven directly from the press ram, with any ram stroke up to 6", and has sufficient power to pull the stock through a roll-type straightener. Simple installation and adjustment permits it to be readily removed from one press and used on another when desired. **T-1-27**





MERZ NEW-MATICS ACCURATELY MEASURE I.D. OR O.D. . . . REGARDLESS OF SURFACE CONDITIONS

● Only MERZ *New-Matic* Measuring Machines enable you to obtain identical I.D. or O.D. readings—*every time*—on parts of like diameter . . . *regardless of surface variations.* In MERZ *New-Matics*, a synthetic ruby button contacts only the highest surface points. Unlike conventional gages—where compressed air directly touches *all* surfaces, high and low alike—MERZ *New-Matics* are unaffected by any surface variations.

For the same reason, MERZ *New-Matics* are the only air-actuated units capable of accurately gaging parts in which perforations or keyways have been machined. MERZ *New-Matic* Measuring Machines also permit accurate gaging to the extreme edges.

For full details on these and many other advantages of MERZ inspection equipment, write for free 20-page book on the *New-Matic* principle of measuring and sorting.

MERZ ENGINEERING COMPANY • INDIANAPOLIS 7, IND.

MERZ "Master" *New-Matic* Measuring Machine. Other *New-Matic* models for every inspection purpose.

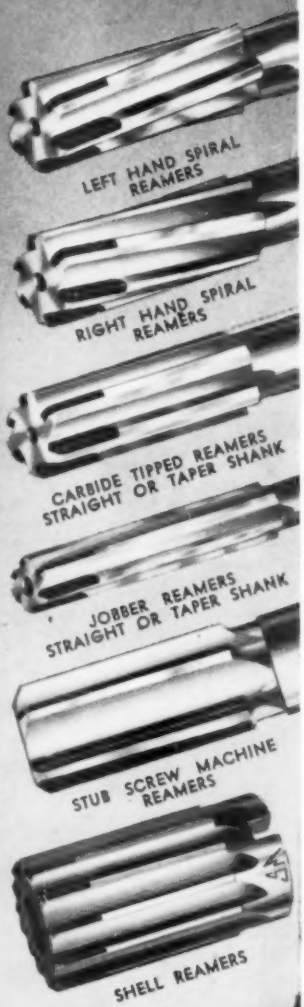
MERZ

WENDT SONIS

Line of Reamers

IS COMPLETE

CARBIDE FULL LENGTH FLUTE REAMERS STRAIGHT OR TAPER SHANK

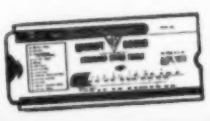

LEFT HAND SPIRAL REAMERS
RIGHT HAND SPIRAL REAMERS
CARBIDE TIPPED REAMERS STRAIGHT OR TAPER SHANK
JOBBER REAMERS STRAIGHT OR TAPER SHANK
STUB SCREW MACHINE REAMERS
SHELL REAMERS

- COMPLETE RANGE OF SIZES
- WIDE SELECTION OF STYLES
- HARDENED STEEL SHANKS
- ADVANCED DESIGNS

The W-S line of reamers is so complete that they can meet practically all your reaming requirements. For example, W-S Straight Shank Reamers style SSR are available from stock in 37 sizes ranging from 1/8" to 1½". Similar ranges of sizes are available in 12 other types of standard reamers. Quick delivery can be obtained on standard reamers with special diameters and tolerances. "Engineered for the Job" design increases production and saves on tool costs. You get longer wear—greater accuracy when you select Wendt-Sonis Reamers for your requirements.

Free! **W-S SPEED AND FEED CALCULATOR**

Quickly figures feed and speeds on reaming and other operations. Write WENDT-SONIS COMPANY, Hannibal, Missouri, —580 North Prairie Ave., Hawthorne, Calif. — 1361 West Lake St., Chicago, Ill.



WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL BITS

New B & S Grinder

A new addition to the line of tools by *Brown & Sharpe Mfg. Co.*, is the No. 5 Cutter and Tool **GRINDING MACHINE**, developed specifically to handle tool-room sharpening jobs of the smaller class, especially end mills.

Important improvements include super-sensitive operation, the result of an ingeniously designed table which slides on 36 precision ground rolls. The double ended spindle is mounted on super-precision ball bearings, permanently sealed grease-lubricated type. The one-piece base rests on three points to insure alignment.

Swing, on centers, is 6⅜"; center distance, wheel to work spindle, 1-5/8" to 8⅛"; distance d/l of wheel spindle to top of table 1⅜ to 6-7/8". The whole is designed for maximum operator convenience and quick and accurate setups.

T-1-28

New Screw Anchors

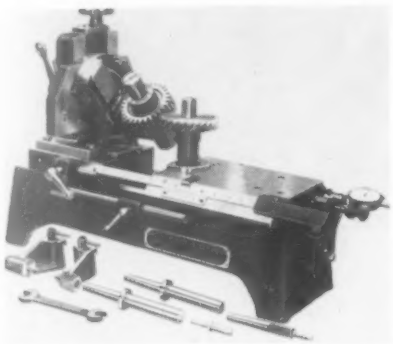
A basic new development in an all-purpose **SCREW ANCHOR** is announced by *Holub Industries*. Known as the Sandscott Plastic Expanding Anchor, and employing overlapping internal and external slits to give "concertina" expansion, the holding power is said to be such that, in pull-out tests, a No. 20 wood screw withstood a load of 2965 lbs.

The anchors are slightly larger than the hole size to be drilled, and the construction effects a tight grip in the hole and on the screw. The makers claim that the anchors are unaffected by water, weather or acids, and that they will hold on temperatures from 78 below to 180° above zero, Fahrenheit.

T-1-29

New Parkson Gear Tester

The 9" Parkson **GEAR TESTER** has been completely redesigned and the new machine now incorporates, as the most outstanding improvement, an adjustable stop-rod in addition to the precision scale and long vernier which are used for the setting of the center distance. When a number of gears of the same size are to be tested, it is no longer necessary to repeat the scale setting; instead, the stop-rod is set and clamped in position.

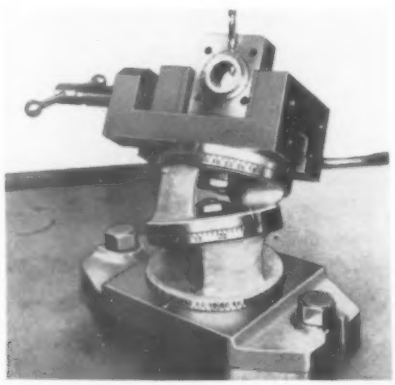


To change the setup, the left-hand slide is moved out of the way; the gears on the arbor are replaced and the slide is then quickly and positively brought back into the same position against the stop. This greatly speeds up the operation in repetitive tests.

While the machine shown is set up for spiral gears, it is also available for spur, bevel, and worm gears, either in combination or single purpose models. The tool is distributed, in this country, by the *George Scherr Company.*

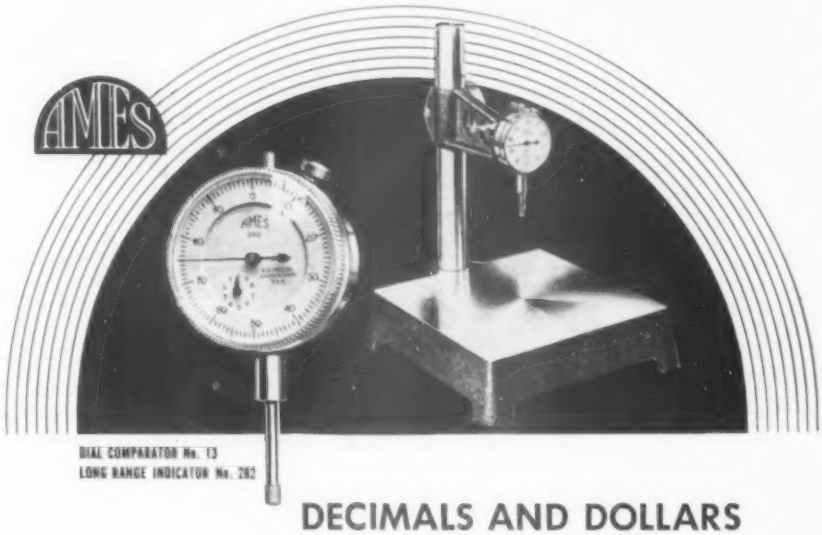
T-1-30

Universal Swivel Vise



An Angle Swivel Vise—the **UNION-VISE**, by the *Union Tool Company*—is designed with all circular plates of like diameter, and with similar graduations, so that it can be mounted as a single, double or triple swivel vise. Each plate swings in a complete 360° arc; consequently, one can obtain practically any combination of simple or compound angles desired.

Simple and sturdy, and provided with deep jaws and large-diameter screw, the tool can be bolted to the table of all types of machine tools, or held on a magnetic chuck. **T-1-31**



DECIMALS AND DOLLARS

When you want to measure those decimals with maximum dollar savings, do it with an AMES DIAL COMPARATOR such as Model No. 13 shown above. Quickly and easily set to the required dimension. Maintains its setting even with rough usage. Gives instant, *accurate* readings — independent of the human factor. You'll find no other Comparator gives you such high production while saving so much in time and labor.

The 8"-square cast-iron base may be fitted with V-blocks, anvils, or stops of various kinds. The indicator-holding bracket extends 4" over the base and is easily adjustable on the 9" column. Measuring capacity is 6". Net weight 16 lbs.

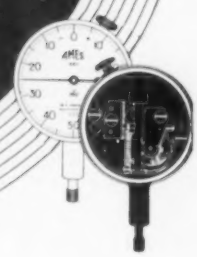
The indicator shown is one of a complete line of AMES Long Range Indicators from which you may select exactly the graduations, range, and dial reading best suited to your needs.

Write for information on our full line of Comparators and many other measuring instruments. Address our Home Office: 30 Ames Street, Waltham 54, Mass.

B. C. AMES CO.

Mfr. of Micrometer Dial Gauges
Micrometer Dial Indicators

Representatives in principal cities

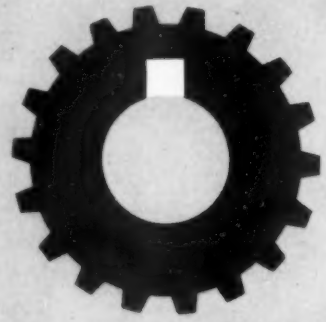


TIME IS MONEY...

BIG

MONEY TODAY

How long does it take you to cut a keyway like this?



With This Minute Man Keyway Broach Kit you can cut any keyway by hand in one minute in Gears, Pulley Hubs, Couplings, Collars, Milling Cutters, etc.

Pays For Itself In No Time. Cut a few keyways and this Set of Fine Tools and a handy, sturdy duMont Arbor Press (if you haven't one already) owes you nothing at all.

Ask Your Mill Supply Distributor to show you the complete range of *Minute Man* Kits so you can select the one that meets your shop needs most economically.

Mail This Coupon. Get the whole story on what this Kit does, how it works, how little it costs.

The du MONT CORPORATION, Greenfield, Massachusetts
Please send me Descriptive Folder and Price List "C"

COMPANY.....

ADDRESS.....

CITY.....

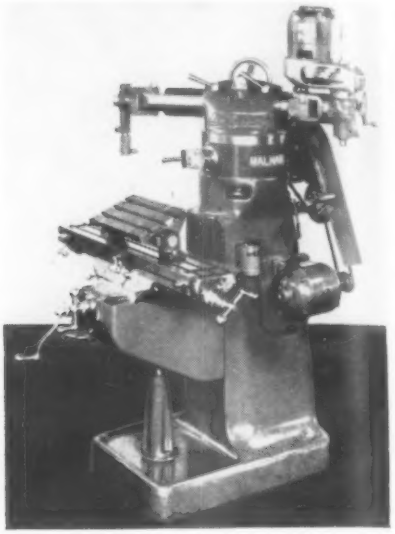
NAME & TITLE.....

The du MONT CORPORATION

GREENFIELD, MASSACHUSETTS

Malnar Horizontal Unit

A horizontal **MILLING UNIT** by *Malnar Machine & Tool Co., Inc.*, adapts Bridgeport Universal millers to horizontal work, thereby greatly increasing its versatility. Expressly engineered for use with the Bridgeport, the Malnar Horizontal Unit becomes a permanent and integral part of the machine and provides for both vertical and horizontal work without resetting.



The unit, shown inset between the base of the Bridgeport and the head, is ordinarily provided with a Brown & Sharpe No. 10 standard taper; however, any spindle taper up to No. 40 may be had if desired. Spindle speeds range from 125 to 1800 rpm.

Also, by Malnar, is a **UNIVERSAL WORK TABLE,** designed as an auxiliary to the Bridgeport table and tiltable in either direction from 0 to 45°. Angles are set by a dial, located at the end of the table which is available at extra cost. **T-1-32**

To keep ye Wolfe from ye Doore

Let your light so shine from the printed page that men may discern your good works and desire to have business dealings with you.

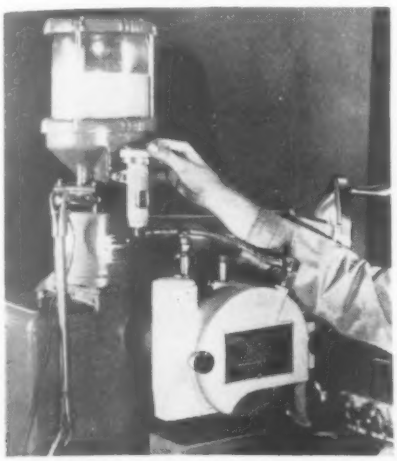
C. F. WORFOLK

Algonac, Mich.

Free Lance Writer, Editor, Planner—good technical copy —"Ghost" or "Regular"— your office or mine.

Cool Grinding

In "Cool Grinding", as it has been named, *The DoALL Company* introduces what is said to be a revolutionary method of cooling work when being ground. Simple in principle, this innovation gives operators of grinding machines the benefits of the visibility of dry grinding with finger tip, absolute control over adequate cooling of the work being ground.



Introducing the coolant directly at the point of contact between wheel and work eliminates the need for splash guards, settling tanks, pump motors, hoses and floor space formerly occupied by coolant units, thus representing a considerable saving in equipment cost, plus additional savings in coolant oils since only a small amount of coolant is used. Furthermore, there is none of the mess usually associated with conventional coolant systems.

The **"Cool Grinding"** unit consists of a coolant reservoir mounted on the spindle column, a sight drip valve and a special wheel adapter. The coolant, fed from the reservoir at a rate of from one to four drops a second, is directed into the front of the special wheel adapter where it enters the arbor hole of the grinding wheel and is then thrown by centrifugal force to the outside grinding face of the wheel.

Whereas, in conventional wet grinding, the material at the point of contact between wheel and work is raised to a very high temperature because the coolant is applied, not at point of contact but behind the cut, the shock of the sudden cooling often results in surface cracks. With "Cool Grinding", on the other hand, the coolant is applied at the actual point of grinding, resulting in temperatures said to be held several hundred degrees below those found in even the best conventional wet grinding systems. Thus, surface cracks are greatly reduced if not virtually eliminated.

Among other advantages claimed for "Cool Grinding" is that, as the coolant flows thru the wheel, it flushes the grinding surface and keeps it clean. This results in longer wheel life and better finishes, especially in softer materials such as copper, bronze, aluminum and other non-ferrous materials. **T-1-33**

MODERN
MICROHONING is
AUTOMATIC
PROCESSING CONTROL

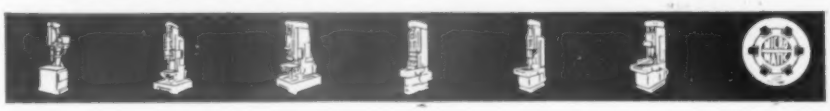
4 COMBINED RESULTS IN ONE PROCESS
★ GEOMETRIC ACCURACY
★ AUTOMATIC SIZE CONTROL
★ HEAVY STOCK REMOVAL
★ FUNCTIONAL SURFACE FINISH

MICROMATIC HYDROHONERS
equipped with Microhoning Tools

in many different installations have cut total processing by one or two operations—have reduced the over-all amount of waste stock removal—have generated uniform final size AUTOMATICALLY within 0.0001 to 0.0003-inch—eliminated selective fits in some parts—reduced inspections to one or two spot checks per shift.

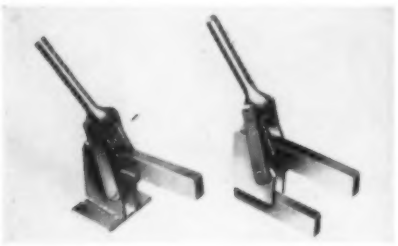
The highlights of Modern Microhoning are available in sets of several booklets. Don't you want a set?

MICROMATIC HONE CORPORATION
8100 SCHOOLCRAFT AVE. • DETROIT 4, MICHIGAN
Los Angeles, Calif. • Houston, Texas • Rockford, Ill. • Guilford, Conn. • Brantford, Ont., Can.



Heavy Duty Toggle Clamp

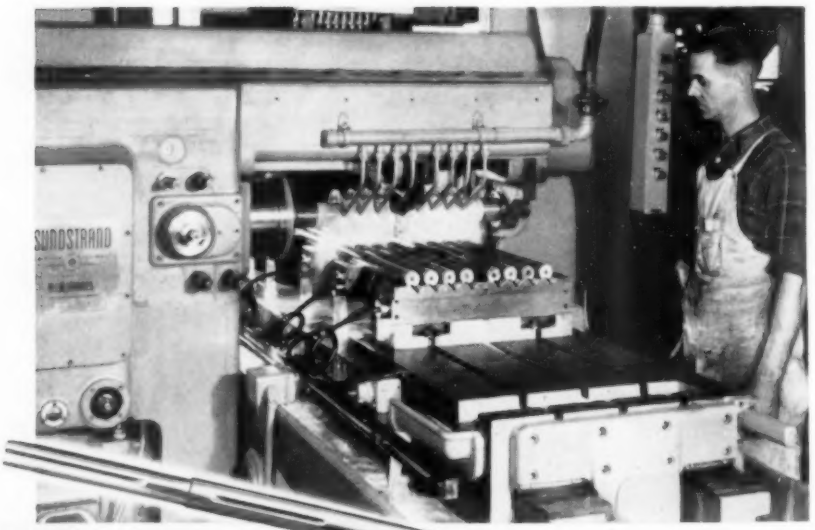
The *General Welding Co.* announces a new line of all welded **TOGGLE CLAMPS** designed to withstand severe service. They are of extra rugged construction with all pivot pins welded to the frame and linkage, with design of the latter said to greatly increase the clamping pressure.



The clamp on the left is the Model A-2, useful on drill jigs and milling fixtures, while the Model B-2, at right, is an extremely versatile clamp which can be used with either bar acting as the clamp bar. This feature enables it to be used where other types would obstruct the work, such as intricate welding or assembly operations.

T-1-34

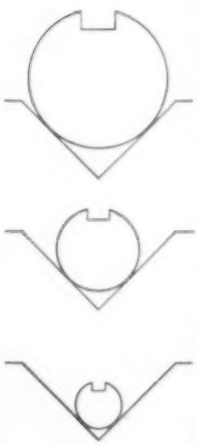
For Tool Engineer's Service Bureau, turn to pages 96 and 97.



Milling Keyways

EASIER — FASTER

with Power-Grip Holding



Photograph shows eight shafts held with POWER-GRIP CHUCKS. Four keyways 5" x 1/2" x 1/4" deep are milled in each shaft. Shaft is 1-5/8" dia. with ends 1-1/2" dia. Cutters are 6" dia. staggered tooth H.S.S. side mills. Feed rate is 5" p.m., and rapid traverse 300" p.m. Diameters down to 11/16" are milled in same fixture.

For milling keyways in large or small shafts, shafts with multiple diameters, in production quantities, or short runs of mixed sizes, Power-Grip Chucks and Fixtures represent a modern magnetic holding technique. Deep magnetic penetration, accomplishing extreme holding power with low voltage, makes possible fixtures adaptable to a wide range of sizes.

Send us prints of your keyway or other milling jobs, so we can submit our proposal for Power-Grip Holding.

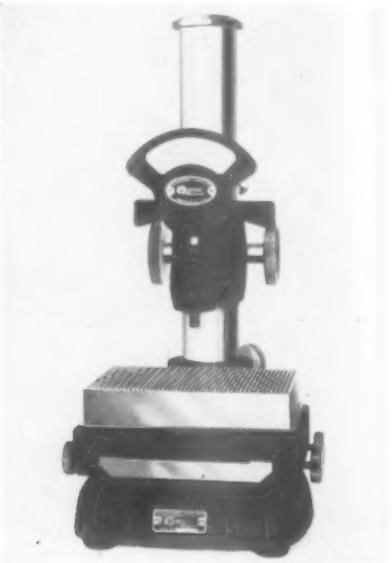
ROCKFORD MAGNETIC PRODUCTS CO., INC.
1304 18th Avenue, Rockford, Illinois

Send for This Booklet

ROCKFORD POWER-GRIP CHUCKS

New Standard Comparator

Provisions for five interchangeable tables and the use of standard indicators, features of the new MODEL 108 **COMPARATOR**, by *Standard Gage Company*, suit it to a wide range of production and inspection measuring jobs.



Any AGD dial indicator of the No.2 of No. 3 size having standard lug type back can be used; thus, an indicator having graduations appropriate to the accuracy desired may be mounted on the comparator. With the Micronar Indicator, which affords a simple and effective means of checking plug gages, measurements can be made to an accuracy usually associated only with more elaborate instruments.

Raising, lowering, and approximate positioning of the indicator support arm are facilitated by a rack on the rear of the column, while fine adjustment, for setting the comparator to a standard, is effected by a wing handle. Pressure of the contact point on the work piece can be regulated by means of a knurled bushing, a reed mechanism within the head preventing side thrust from reaching the indicator and thus adversely affecting accuracy. Tables are available as follows: 1½" x 4" serrated, 6" x 4" serrated, 1½" x 4" plain, and one with 1½" diameter rolls for checking lobal conditions. **T-1-35**

New Toolroom Steel

A new, balanced Alloy **TOOL STEEL**, called T.R.S. "Tool Room Specialty Steel" and said to embody the best features of oil, air and water hardening steels is a recent development by the *Amalgamated Steel Corporation.*

While not claimed as a "cure-all," the makers (who are rather conservative) neverthleless believe that this steel can be used on 80 percent of the jobs in average shops, and with excellent results. They do claim that it will not crack in heat treatment, that it welds and forges readily and machines with an excellent finish. **T-1-36**

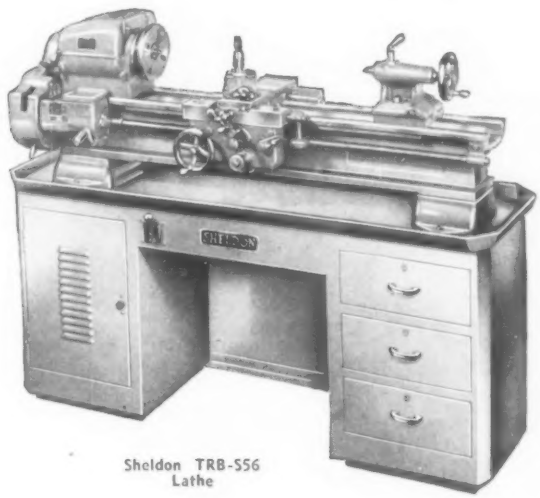
New Di-Acro Notcher

The **DI-ACRO NOTCHER**, by *O'Neil-Irwin Manufacturing Company*, is the latest in their line of Die-Less Duplicating Equipment. With this tool, at present confined to 16 gauge steel plate, a 90 degree notch of any size can be accurately cut in one operation, either at a corner or in any position along the edge of a sheet.

Powerful action is obtained through a roller bearing cam which evenly distributes shearing pressure, simultaneously, on both shear blades. An extremely fexible gauging arrangement, built into the Notcher, allows a notch of any dimension desired to be exactly located, thus providing precision in all duplicated parts. **T-1-37**

SHELDON

TRB-S56 precision lathes



Sheldon TRB-S56 Lathe

Production Capacity

The new TRB-S56 Sheldon Precision Lathes have the speed, stamina and capacity for general production use—11¼" swing, 1⅜" hole thru spindle. 1" collet capacity. They will operate safely at high speed and work to the very closest tolerances, *for spindle bearings are "Zero Precision"* tapered roller bearings, the most accurate obtainable.

They will take a "healthy cut" too, *because they have double V-belts to the spindle* to assure full power from their 1 h.p. motor at the point of work. They come ready for production—no breaking-in period is required—start earning from the day received.

Write for Catalog of Sheldon and Sheldon-Vernon.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4229 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

ThredKut *

INCREASED OUTPUT 4 to 1

. . . reports JOHN L. MOROSINI D. A. Stuart Oil Co. Representative

"Prior to using THREDKUT,* this customer had tried several types of cutting oil in tapping 1½" dia. x 1" holes in very tough cast steel, with a maximum production of 50 tapped holes before sharpening was necessary. On switching to THREDKUT,* output immediately increased to 200 tapped holes between sharpenings. Here is another instance where THREDKUT* demonstrated its well-established reputation for licking a tough job."

John L. Morosini

ThredKut *

. . . Stuart's THREDKUT is a unique cutting oil carefully manufactured to insure the maximum benefits from controlled chemical activity. Its outstanding performance on really tough jobs has long been recognized and its flexibility proved through exceedingly widespread use. The many time-tested values built into THREDKUT are serving the leaders of the metal-working industry, increasing efficiency and reducing costs.

Ask to have a Stuart Service Engineer discuss your cutting fluid requirements. THREDKUT literature available on request.

STUART *service goes with every barrel*

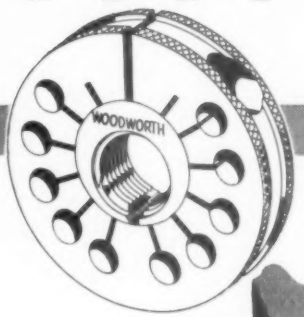
WRITE FOR DETAILS

D. A. Stuart Oil Co. EST. 1919 LIMITED

2727-49 South Troy Street, Chicago 23, Ill.

WOODWORTH GAGES *ACCEPTED* BY ALL INDUSTRY . . . . . !

GREEN—GO



RED—NOT GO

Industry by industry—coast to coast—wherever accuracy and durability count—Woodworth Company is winning and holding new friends—with the *ACCEPTED ADJUSTABLE THREAD RING GAGE.*

ACCURACY YOU CAN TRUST

★There's a Woodworth representative near to serve you. Write us for his name.

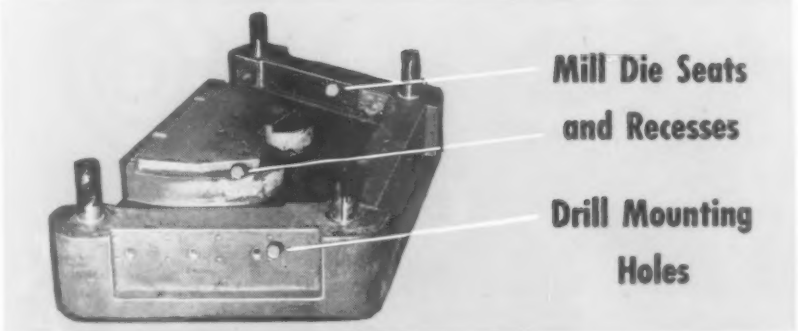
SEND FOR—The new 1948 Woodworth Gage Catalog just off the presses. Requests for copies must be written on company letterheads.

WOODWORTH

N. A. WOODWORTH CO., 1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

COMPLETE LINE OF PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOK JIGS

DANLY Special Die Sets — *Ready for mounting the Dies on Specification*

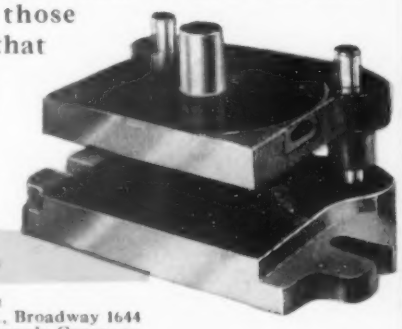


"Mill die seats and recesses; drill mounting holes; mill mounting pads." The work performed on the set shown here is an example of the machining operations that Danly can do for you while your die set is in process. In many cases this necessary machining can be done on the same setup as standard operations on the die set, thereby minimizing setup and handling time.

Additional machining may be specified on any "special" including M-K and A-S sets which can be ordered directly from the Danly Catalog.

This Danly service is especially valuable on large sets. Milling, drilling and boring operations, so easily handled here may cause difficulty in the die shop or your own tool room where equipment is not specifically suited to large work.

Investigate this time saving and cost cutting service. On your next special die set order consider Danly's service for those "extra" operations that can be handled here. Your die set will be delivered "ready for mounting the dies."



DANLY MACHINE SPECIALTIES, INC., 2100 So. 52nd Ave., Chicago 50, Ill.

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1549 Temple Ave., Cherry 6666
Rochester 4, New York
16 Commercial St., Main 2554
Cleveland 14, Ohio
1550 East 33rd St., Express 0300

Philadelphia 44, Pennsylvania
18 West Chelten Ave., Victor 40011
Long Island City 1, New York
47-28 Thirty-Seventh St., Ironsides 6-8080
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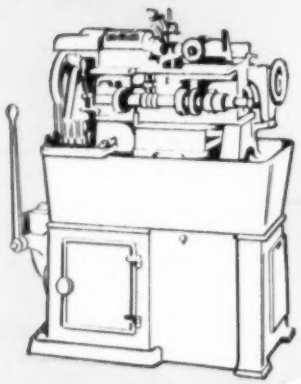
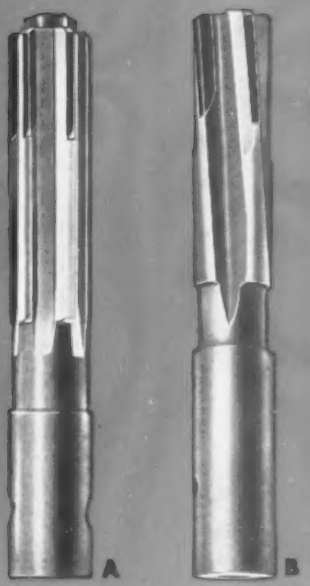
DANLY *Special* DIE SETS

MACHINED TO YOUR SPECIFICATIONS

TOP PRODUCTION TEAM

for HIGH Accuracy and LONG Runs





AUTOMATIC SCREW MACHINES PLUS **Staples CARBOLOY-TIPPED** CEMENTED CARBIDES **STUB SCREW MACHINE REAMERS**

Staples stub screw machine reamers cut production costs on automatic screw machine operations by eliminating frequent down time for reamer sharpening. Carboloy surfaces are highly resistant to wear—far exceed H.S.S. on tool life. Tools hold accurate diameters, permitting long runs on exceptionally close tolerance work.

These reamers are made both in solid and expansion types. Tools are stocked semi-finished and are ground to size specified with tolerance of .0003" on diameter. A complete range of sizes is available for immediate delivery.

(A) Staples Carboloy - tipped Expansion Stub Screw Machine Reamer.

Staples patented expansion principle permits easy adjustment of tool to .0001". Expansion plug limited to $^{3}/_{32}$" extension beyond tool end (width of cut-off blade) eliminates possibility of plug striking bottom of drilled hole. Can also be furnished with plug flush with tool end if specified.

(B) Staples Carboloy - tipped Solid Stub Screw Machine Reamer.

THE STAPLES TOOL COMPANY
CINCINNATI 25, OHIO
Distributors in Major Cities

write for your complete Staples Tool catalog

Staples CARBOLOY CEMENTED CARBIDE TOOLS

A COMPLETE LINE OF SINGLE AND MULTIPLE POINT CUTTING TOOLS
EXPANSION REAMERS · FORM TOOLS · CENTERS · MASONRY DRILLS · SPECIAL TOOLS

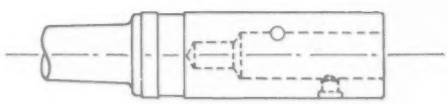
A New CUTTING TOOL SHANK - THE *METCUT* CLUTCH DRIVE

(NOT PATENTED)

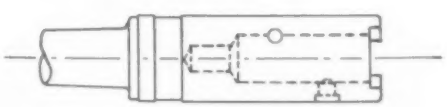
combines EXTREME STRENGTH with the QUICK CHANGE features of the pin drive.

FEATURING:

- **CLUTCH DRIVE—** for tremendous strength
- **PIN LOCK—** for easy, rapid change
- **HEAVY DUTY—** drives on largest diameter
- **QUICK CHANGE—** twist 1/4 turn to lock or unlock
- **ADAPTABILITY—** Pin Drive Holders may be altered for use with Clutch Drive Tools. (See sketches)



Pin Drive Holder can be altered to Clutch Drive Holder by Cutting In the Clutch.



Pin Drive, as well as Clutch Drive Cutters, can be used in Clutch Drive Holders.

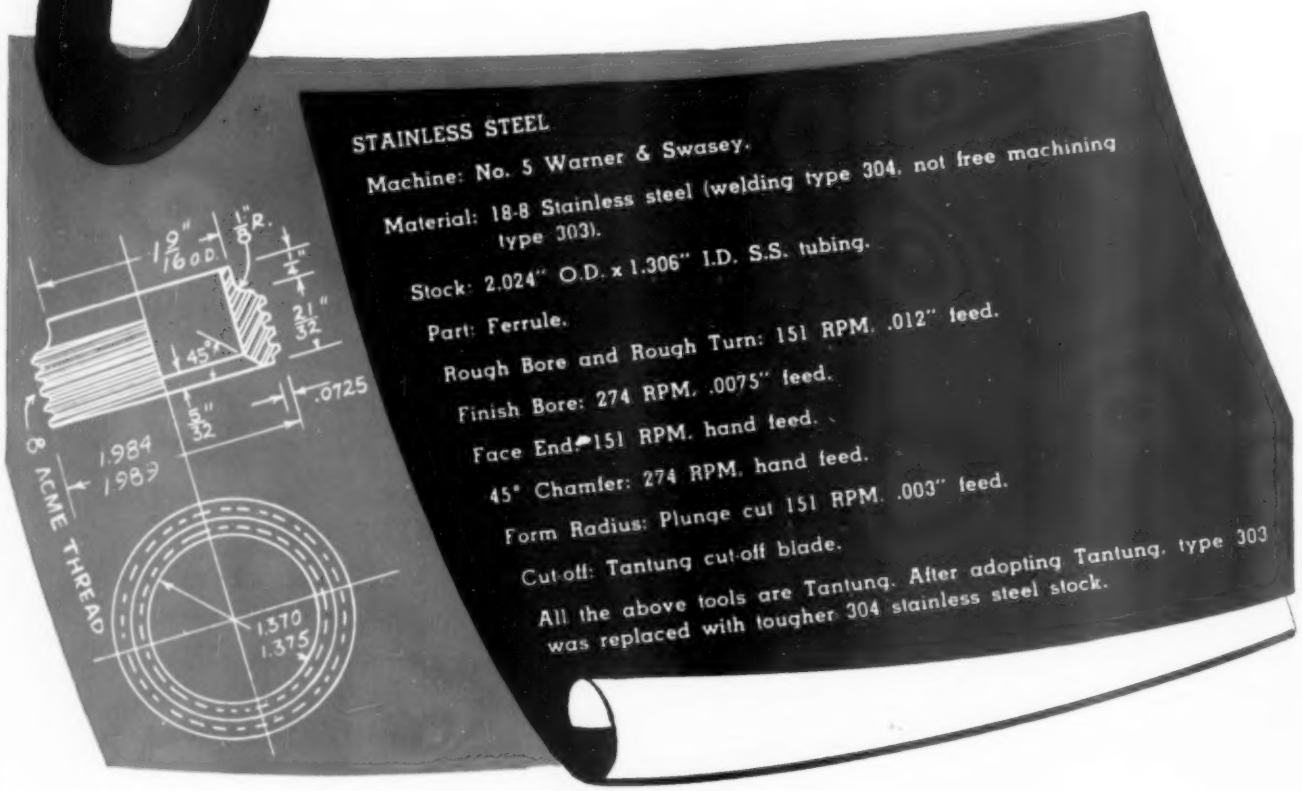
Specifications sent on request. Let us quote on your tool requirements.

METCUT **METAL CUTTING TOOLS, INC.**
ROCKFORD, ILLINOIS

Report No. 6

TANTUNG TOOLS AND STAINLESS STEEL

Facing, Boring, Turning, Chamfering, Forming and Cut-off with Tantung


STAINLESS STEEL
Machine: No. 5 Warner & Swasey.
Material: 18-8 Stainless steel (welding type 304, not free machining type 303).
Stock: 2.024" O.D. x 1.306" I.D. S.S. tubing.
Part: Ferrule.
Rough Bore and Rough Turn: 151 RPM. .012" feed.
Finish Bore: 274 RPM. .0075" feed.
Face End: 151 RPM. hand feed.
45° Chamfer: 274 RPM. hand feed.
Form Radius: Plunge cut 151 RPM. .003" feed.
Cut-off: Tantung cut-off blade.
All the above tools are Tantung. After adopting Tantung, type 303 was replaced with tougher 304 stainless steel stock.
1.984
1.989
8 ACME THREAD
1.370
1.375
.0725
45°

The machining of high chrome and nickel, stainless steels, cold rolled and copper alloys, from free cutting brass to Beryllium copper has proved Tantung's superiority. In many instances, tool life is increased up to 1200%.

In machining stainless steels, Tantung's lubricating characteristic makes stainless steel chips SLIDE over the top surface without cratering the tool. Since Tantung has a much higher red hardness than H.S.S. tools and a higher transverse rupture strength than average cast alloy tools, it is ideally suited for operation under excessive vibration, shock and interrupted cuts.

Remember—don't "baby" Tantung. Tantung produces more pieces per grind at speeds and feeds far above standard H.S.S. tools.

Write today for additional information regarding the outstanding performance of Tantung drills, Keyway cutters, nonferrous and metal cutting tools.

MAKERS OF WORLD'S FINEST VR Carbides

VASCOLOY-RAMET CORPORATION NORTH CHICAGO ILLINOIS, U. S. A.

District Sales and Service in Principal Cities

AN AFFILIATE OF FANSTEEL METALLURGICAL CORPORATION AND VANADIUM ALLOYS STEEL COMPANY

FOR PRECISION BORING IT'S... V-R* CARBIDES by 65,256

V-R CARBIDE PERFORMANCE REPORT

Report No.: 1798A | **Subject: Precision Boring Practice** | **Date: 1947**

Tool: 3/8" shank type, V-R carbide boring tools.
Style: RB-34-R2A

Grade: EH

Recommended for: Steel precision boring and light finishing cuts at high speeds where close dimensional tolerances are essential.

SET-UP

Part: Split Connecting Rod.
Operation: Precision boring. Bore diameter 2.6483" plus .0000 minus .0004 by 1-5/8" long.
Material: 2340A forging at 250 brinell hardness.

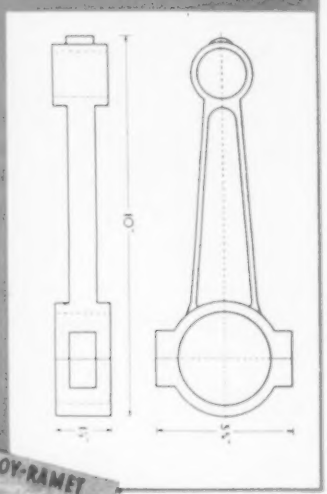
Machine: Model 1212 Excello boring machine.
Speed: 518 surface feet per minute.
Feed: 4" per minute or .008 per revolution.
Depth of Cut: .010".

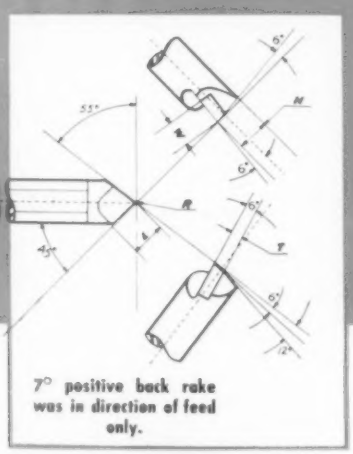
PERFORMANCE DATA:

The V-R carbide tipped boring tool machined 24 rods before any loss of rod diameter was visible on the air gage. After 24 rods, the tool was advanced .00015 and operation was continued with the same fine result.

NOTE: This means that the V-R carbide tipped boring tool machined 65,256 lineal inches (more than 1 mile) at a speed of 518 sfm, averaged 1500 interrupted cuts per minute and removed 326.40 square inches of tough metal with LESS THAN .0002 WEAR on the delicate tool radius (see illustration).

Other carbides tested averaged less than 8 rods per grind.





7° positive back rake was in direction of feed only.

MAKERS OF WORLD'S FINEST VR Carbides

Ask your nearest Vascoloy-Ramet Field Engineer about V-R carbide precision boring and machining applications TODAY! Remember, when you ask about V-R you are asking about the world's finest carbides.

* Reg. U. S. Pat. Off.

Send for your free copy of the V-R 400 Carbide Tool and Blank Catalog, 32 pages of important carbide engineering information.

VASCOLOY-RAMET CORPORATION NORTH CHICAGO ILLINOIS, U. S. A.
District Sales and Service in Principal Cities
AN AFFILIATE OF FANSTEEL METALLURGICAL CORPORATION AND VANADIUM ALLOYS STEEL COMPANY

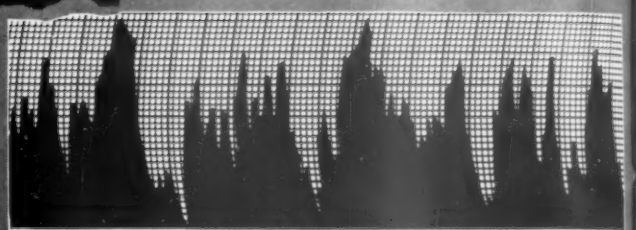
like skating on cinders!

How long could rollers stand this? Not long . . . yet bearings must stand this same kind of punishment with a typical "finished" surface.

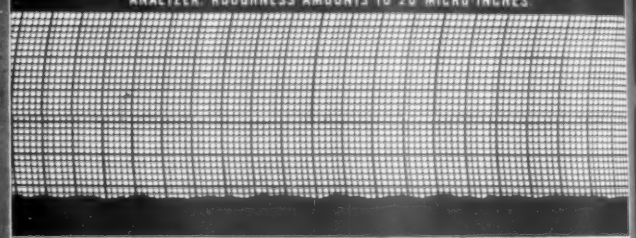
There it is, at the right, an actual profile of a normal ground surface as shown by the Brush Surface Analyzer. Look at those ups and downs, and you'll see why bearings wear out before their time.

Now look below at the Brush analysis of a *Superfinished* surface. Smooth? Yes, *seven times as smooth* as the usual ground surface! No grinder scratches, no feed spirals, no chatter marks, no fragmented metal.

Without such defects to rupture the protective film of oil, the life of a bearing has no limit. So it pays to know about Superfinishing . . . and Gisholt engineers are ready with the facts.



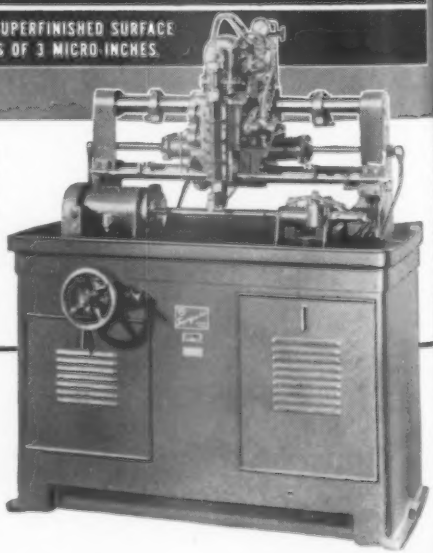
NORMAL GROUND SURFACE AS IT APPEARS TO THE BRUSH SURFACE ANALYZER. ROUGHNESS AMOUNTS TO 20 MICRO-INCHES



BRUSH ANALYSIS OF A SUPERFINISHED SURFACE SHOWS A SMOOTHNESS OF 3 MICRO-INCHES.

GISHOLT MACHINE COMPANY

1245 E. Washington Ave. • Madison 3, Wisconsin



THE GENERAL PURPOSE SUPERFINISHER is a self-contained unit, simple to operate. Handles a wide variety of miscellaneous or production work. Also available — — specialized machines for all requirements.

THE GISHOLT ROUND TABLE *represents the collective experience of leading specialists in the machining, surface finishing, and balancing of round or semi-round parts. Your problems are welcomed here.*

What Every Designer Should Know *about the versatile Gear Shaper and its ability to cut costs in quantity production of all types of Contours.*

Reciprocating Generation

THE BASIS OF UNPARALLELED GEAR SHAPER VERSATILITY

A CUTTER
THAT RECIPROCATES WITH (OR WITHOUT) ROTATION

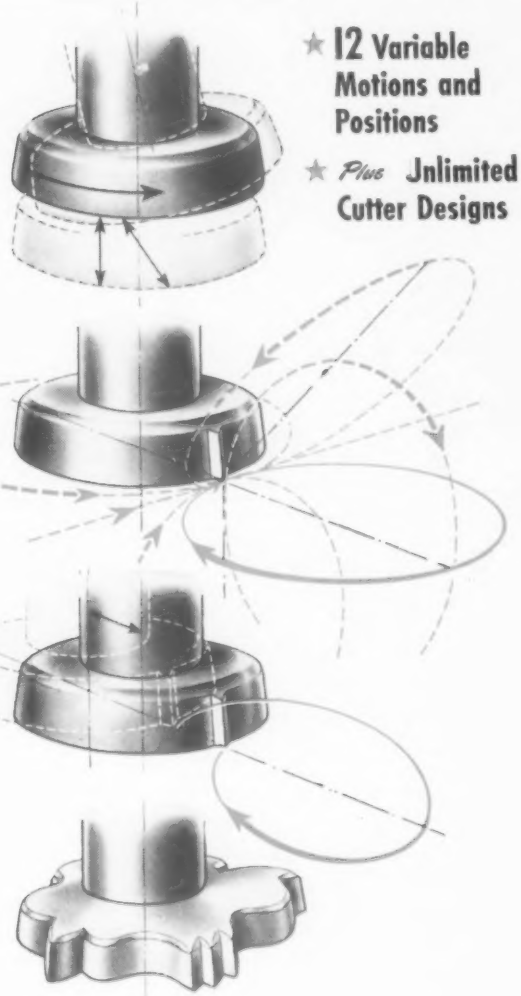
★ **12 Variable Motions and Positions**

★ *Plus* **Unlimited Cutter Designs**

WORK
POSITIONED IN ANY PLANE ...WITH OR WITHOUT ROTARY, LATERAL OR COMBINED MOTIONS

A CUTTER SPINDLE
THAT CAN BE MOVED IN AND OUT

CUTTER PROFILES
OF ANY REQUIRED CONTOUR



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Fellows

For an interesting perspective on the broad range of Gear Shaper applications ask for our 48-page booklet, "The Art of Generating with a Reciprocating Tool". Write: The Fellows Gear Shaper Co., Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2, 640 West Town Office Bldg., Chicago 12, 7706 Empire State Bldg., New York 1.

There *is* a quality secret in the nature of our TOOL STEELS

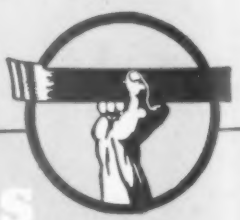
We call it CMF

Controlled Melting Formulas

The *easy-working, tough-hardening* quality distinguishing our fine Tool Steels, and known to every customer, is a Vanadium-Alloys accomplishment based not on "magic" but on *controlled melting formulas.*

These formulas are private—exclusive developments of Vanadium-Alloys' metallurgical research extending over forty-five years, devoted solely to the improvement of tool steels for every industrial purpose. As a user of our Tool Steels, you benefit by the *results* . . . so unmistakably evident in service!

"Visit us at Latrobe to inspect our plant and processes—you'll be welcome!



Manufacturers of
FIRST QUALITY
TOOL and DIE STEELS
—exclusively

Vanadium-Alloys
STEEL COMPANY
COLONIAL STEEL DIVISION ANCHOR DRAWN STEEL CO.
LATROBE, PENNA.

Make Quick, Accurate Adjustment

WITH SCULLY-JONES ADJUSTABLE-ADAPTER-ASSEMBLIES

FAST and EASY as 1-2-3

1. Release set screw in the side of spindle.
2. Release screw in nut.
3. Shorten or lengthen projection by turning the nut.

SPINDLE EXTENSION ASSEMBLIES—Styles 1800 and 1900—Furnished with Morse Taper Holes and Acme Threads on the shanks.

TENSION AND COMPRESSION TAP HOLDERS—Styles "C" and "D"—Used on multiple spindle tapping heads to compensate for variations in lead of different taps.

In multiple spindle drilling and tapping, save time and money; eliminate trouble and delays; adjust drills and taps fast and easy as One, Two, Three.

Set-up is not disturbed. Accuracy is assured as spindle screw retains the adapter in position, and key furnishes the positive drive. These adapters are carefully heat-treated and ground to assure concentricity.

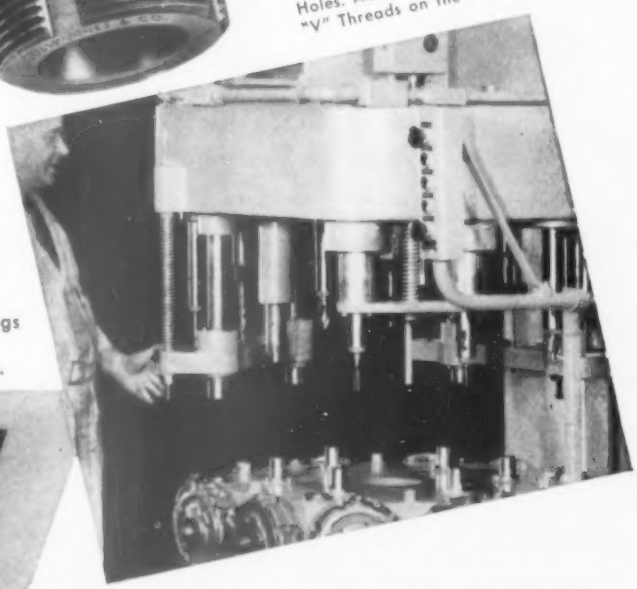
For complete information refer to page 38, and 64 through 78 of Scully-Jones Tool Engineering Manual 500, or write for details.

CHOICE OF TAPERS—Adjustable adapter assemblies are furnished with Morse Taper, "USE-'EM-UP" or Stub Taper Holes. Acme Threads or Standard "V" Threads on the shanks.

MOST STANDARD SIZES ARE CARRIED IN STOCK FOR

IMMEDIATE DELIVERY!

Are You Planning SPECIAL TOOLING? If so, please send your drawings and specifications early. Prompt quotations will be made and delivery dates can be met, thus preventing delays in your production schedules.



TYPICAL APPLICATION—of Scully-Jones Adjustable Adapter Type Assemblies. Close-up of work head and index table of a Special Multiple Spindle Machine, Manufactured by The Cross Co., Detroit, Mich.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

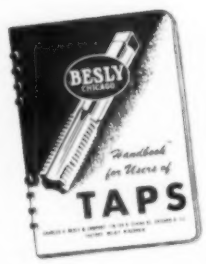
1915 SO. ROCKWELL ST., CHICAGO 8, U. S. A.

2402

BESLY TAPS

ARE PART OF THIS PICTURE

. . . they cut accurate threads for Mercury Outboard Motors



Useful Facts for TAP USERS

Get a free copy of this practical reference manual. It was prepared by shop men for shop men. Tap fits and drill sizes are listed in detail. *Write today on your letterhead for a copy.*

For close tolerance threading of aluminum outboard motor parts the Kiekhaefer Corporation, Cedarburg, and Fond du Lac, Wisconsin, relies on Besly hand, high speed machine screw taps to help achieve the power and reliability for which Mercury Motors are world-famous.

Whatever the needs of the job may be, Besly Taps—*for more than 50 years*—have proved their capacity to meet the most difficult specifications for economical precision threading in all types of work.

Besly engineers are ready to help you select the right tap for the job. Ask your distributor about Besly Taps and Besly service.

BESLY

BESLY TAPS • BESLY TITAN ABRASIVE WHEELS
BESLY GRINDERS AND ACCESSORIES

CHAS. H. BESLY AND COMPANY • *Company Stocks at Chicago and Detroit*
118-124 North Clinton Street, Chicago 6, Illinois • **Factory: Beloit, Wisconsin**

Power and SPEED FOR CARBIDE ROTARY FILES

with the JARVIS "75"

The Multi-Jarvis "75" flexible shaft machines provide the ultimate in extra power and constant high speed for use with tungsten carbide rotary files. Tough jobs are made easy... operator fatigue is held to the minimum.

The Jarvis "75" is available in bench, roller-floor (with tool tray), overhead-suspended-trolley and overhead-suspended-saddle types. Bench and floor units swivel horizontally and vertically. All models are equipped with transparent plastic guards.

Jarvis tungsten carbide rotary files are ground-from-the-solid and are available in standard sizes in fine, standard or coarse fluting. Write for literature on Jarvis Power Tools.

Jarvis POWER TOOLS

THE CHARLES L. JARVIS COMPANY
MIDDLETOWN IN CONNECTICUT

Tapping Attachments • Flexible Shafts and Machine • Quick Change Chucks and Collets • Rotary Files

Accurately Size and Finish Holes in Dies—Jigs—Gauges— FASTER, EASIER, AT LOWER COST

with the SUNNEN PRECISION HONING MACHINE

You can add extra hours of life to your tools and dies—you can reduce the number of repairs, by precision honing all holes from .120" to 2.625". Sunnen Precision Honing is the ideal method to fit dowel pins and ejector pins—to produce smooth, accurate drill jig bushings—and to add extra service life to extrusion dies.

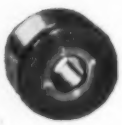
In hardened steel, the Sunnen Precision Honing Machine hones holes that are accurate to .000025", and it produces a surface finish as low as 2 micro inches. Hones perfectly straight round holes, free from bell-mouth and taper. Change over from one size to another can be made in one minute.

Sunnen Precision Honing is many times faster than lapping, which makes it a real time and money saver in your tool room. Gauging is faster and easier since part is always clean. With the Sunnen method you can accurately remove as little stock as .00005".

Range of mandrels from .120" to 2.625" is complete. There are no missing sizes. A complete line of abrasives is available to accurately size and finish every metal except lead and babbitt. New Sunnen Tool Room Mandrel Sets provide a convenient method of storing and selecting the proper size.

For complete information on the Sunnen method of honing for greater accuracy in tool room work, write today — or call in a Sunnen Engineer.

Typical Jobs



Drawing and blanking die "saves time in producing smooth base metal finish."

Sunnen precision honing to a highly polished finish increases wearing quality of these hardened steel drill jig bushings.

Rubber Eraser Extrusion Die "Tripled life of extrusion dies."

Hardened steel ring gauge—finished to an accuracy of .000025" for roundness and straightness.

SUNNEN

TRADE MARK REG. U. S. PAT. OFF. • MARCA REGISTRADA

SUNNEN PRODUCTS COMPANY

7956 Manchester Ave. • St. Louis 17, Missouri

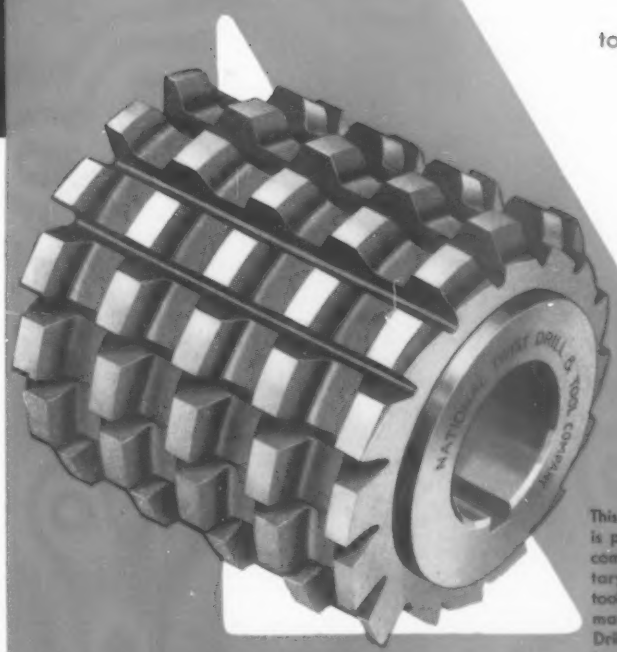
Canadian Factory: Chatham, Ontario

391

PERFORMANCE IS BUILT INTO NATIONAL METAL CUTTING TOOLS

by ENGINEERING Design

Here at National, engineering design is based on practical field experience. National field engineers continually make performance tests, on every kind of material and under all conditions. In the modern, fully-equipped National laboratories, these tests and this experience are translated into concrete tool design. When you specify National rotary metal cutting tools, you get tools that incorporate all of the latest advances in the art of metal cutting.



This Spline Shaft Hob is part of National's complete line of rotary metal cutting tools. National also manufactures Twist Drills, Reamers, Milling Cutters, Counterbores, End Mills, and Special Tools.

Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICHIGAN, U. S. A. Tap and Die Division — Winter Bros. Co.

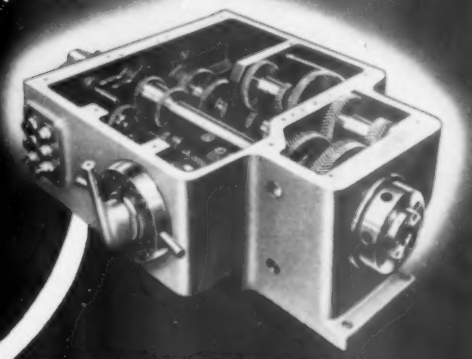
Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

NOT JUST ANOTHER LATHE

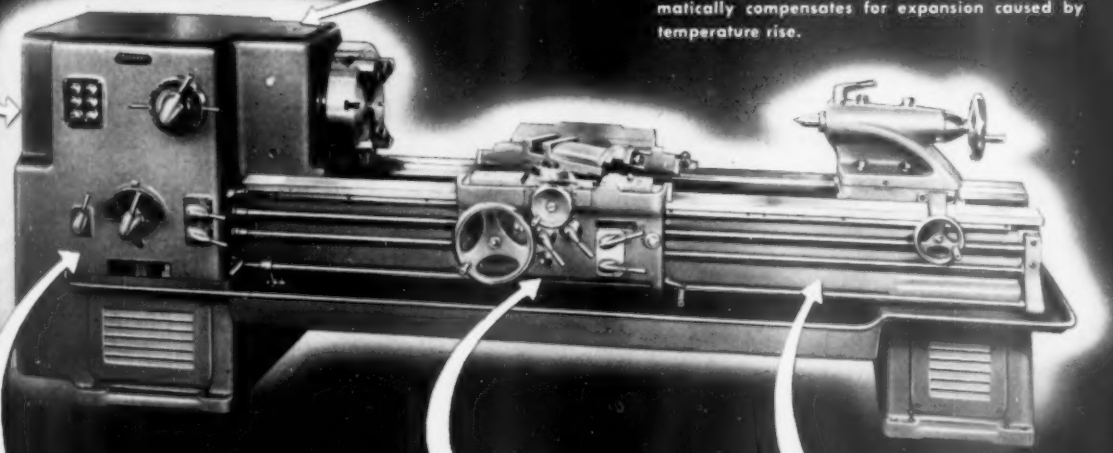
but a Sidney Lathe!

Check these features...

Change gears rotate on anti-friction bearings and are mounted on fixed centers. Driving sheave is mounted on pre-loaded anti-friction bearings and is full floating on sleeve bolted to back of headstock. Drive shaft deflection is thus eliminated.

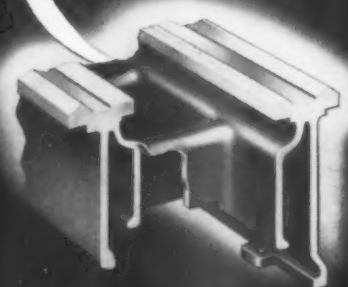


All-herringbone geared headstock provides 32 pre-selective changes of spindle speeds through convenient dial control. Spindle and intermediate shafts are equipped with center bearings in addition to end bearings. Spindle mounting automatically compensates for expansion caused by temperature rise.



Sidney's totally enclosed dial controlled gear box provides 60 changes of threads and feeds. All moving parts run constantly in oil.

Controls are conveniently located for comfortable operation. Off-set compound—extra large micrometer dials—thumb screw dial lock. Notice also the four swivel hold-down bolts for added rigidity.



Rigid four-wall bed construction with double cross girts spaced at 12" intervals. Casting is of semi-steel nickel mixture for close grain structure.

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

Builders of Precision Machinery Since 1904

WINTER BROTHERS TAPS ARE DEPENDABLE!

QUALITY CONTROL

ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

QUALITY control is one reason you get better performance and longer tool life when you specify Winter Taps. Winter's modern heat treating equipment includes automatic time and temperature controls that leave no important operation dependent on the human element. The quality of Winter Taps is safeguarded by rigid inspections at every step in the manufacturing process. Winter quality control is your assurance of more dependable performance always.

Winter Brothers COMPANY

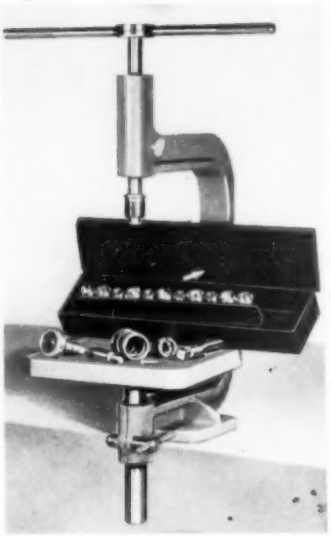
ROCHESTER, MICH. and WRENTHAM, MASS. • Distributors in Principal Cities

A Division of the National Twist Drill and Tool Company • Branch Stores: San Francisco, Chicago, Detroit

NOW! Precision

Tapping & Threading by hand up to 1" dia.

Here is a precision, easy-to-use, hand-operated tapping and threading machine that eliminates out-of-alignment and oversize spoilage!



This machine takes big work! Height from table to chuck, 11½"—will tap or thread to center of 24" work! 12 collets in 1/16 series from 5/16" to 1" (Tap capacity 5/16" to 1", Bolt die capacity ¼ to 1").

This handy tapping and threading machine belongs in your tool room. With it, you can tap and thread quickly and accurately. Ample size table for clamping work, shafts in perfect alignment. Now you can eliminate expensive spoilage and time loss in experimental work and short runs and reduce tap breakage. Machine comes complete with full range of collets and accessories in compact kit. Write us now, today, for full information.

Dealers: Your inquiries are invited!

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Twice the Production . . . with accuracy!!

(HELD TO PLUS OR MINUS .0005)

Twice the production! **A proved statement based on production figures of large and small shops where Hebert Centering Machines have been in daily service *(often side by side with other types)* for almost ten years!**

Why? **The many exclusive features of Hebert Centering Machines is the answer. These double-end hydromatically operated, electrically controlled centering machines require no manual operation of vises or heads . . . the automatic cycle: rapid approach, drill, dwell (adjustable electrically) and automatic rapid return affords maximum per hour production with minimum operator fatigue!**

"First Operation" accuracy! **The accuracy demanded in "first operation" machining is supplied by every Hebert Centering Machine. Ball dimensions over centers, regardless of stock or weight, are held to plus or minus .0005—expediting succeeding operations on automatic turning.**

Hebert Centering Machines **are ideal for short runs or continuous production! Readily changed through a wide range of diameters and lengths, using standard jaws, locators and stops to handle almost every type of centering job. Maximum diameter in vise is 5" with clearance over ways for work up to 18" diameter.**

Write Hebert today for complete performance figures and the sizes of Hebert Centering Machines.

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A1. **Adams Carbide Corp.** "Aids to Carbide Users," Braze and Save.

A2. **Bellows Co.** Bulletin BM22 and new Foto Facts sheets.

A3. **Boyar-Schultz Corp.** New screw machine catalog

A4. **Cushman Chuck Co.** Catalog PO-62, Power Chucking Equipment.

A5. **du Mont Corp.** Descriptive folders: Minute Man Kits.

A6. **Ettco Tool Co.** Bulletin 31, Ettco-Emrick Multiple Head and Fixture Units.

A7. **Fellows Gear Shaper Co.** "The Art of Generating with a Reciprocating Tool."

A8. **Gallmeyer & Livingston Co.** Bulletin GL-101.

A9. **Hardinge Bros., Inc.** Current Bulletin.

A10. **International Nickel Co., Inc.** "List A" of useful booklets.

A11. **Kingsbury Machine Tool Corp.** Bulletins of 40 setups.

A12. **Landis Machine Co.** Bulletins F-80 and F-90.

A13. **Mers Engineering Co.** "New-Matic" principle of measuring and sorting booklet.

A14. **Metal Carbides Corp.** Engineering-Style Catalog 46-T "Standard Talide Tools and Tips."

A15. **Michigan Tool Co.** Bulletin No. 1800-47.

A16. **Micromatic Hone Corp.** Set of "Highlights of Modern Microhoning" booklets.

A17. **Midvale Co.** Three new descriptive catalogs on Forgings, Stainless Castings and Tool Steels.

A18. **Milwaukee Chaplet & Mfg. Co.** Illustrated booklets.

A19. **National Broach and Machine Co.** Bulletin S47-3.

A20. **Niagara Machine and Tool Works.** Bulletin 83.

A21. **The Ohio Knife Co.** Current Catalog.

A22. **O K Tool Co.** Catalog 18.

A23. **Reed Rolled Thread Die Co.** Catalog 62.

A24. **Rockford Magnetic Products Co., Inc.** Booklet, "Magnetic Holding Methods."

A25. **Ruthman Machinery Co.** Catalog 10-1.

A26. **Geo. Scherr Co., Inc.** Small Tool Catalog.

A27. **Severance Tool Industries, Inc.** Catalog No. 16.

A28. **Sheldon Machine Co.** Catalog, Sheldon and Sheldon-Vernon Lathes.

A29. **Staples Tool Co.** Complete Tool Catalog.

A30. **L. S. Starrett Co.** Catalog 26 "E."

A31. **Super Tool Co.** Standard Carbide Tipped Tool Catalog No. 47.

A32. **Swartz Tool Products Co.** Catalog 941.

A33. **Vascoloy-Ramet Corp.** V-R 400 Carbide Tool and Blank catalog.

A34. **Van Keuren Co.** Manual of precision measuring systems (Catalog 32).

A35. **Wales-Strippit Corp.** Functionally-colored, illustrated catalogs.

Circle items desired and mail this card (Students are requested to write direct to manufacturers)

TRADE LITERATURE

1. Abrasive, Tumbling

Pocket manual of 18 pages points out the techniques and advantages of using the new alundum abrasive for precision tumbling of metals and plastics. *Norton Company.*

2. Automatic Machines

Specifications, design and operation details of the 2-1/8" single-spindle, automatic, Dialmatic Model AB, used as either a chucking or bar feed machine, are given in bulletin. *The Cleveland Automatic Machine Co.*

3. Automatic Machines

Twelve-page catalog describes the New Britain line of modern automatics, including screw, chucking and precision boring machines, and turret lathes. *New Britain-Gridley Machine Div'n.*

4. Belting, V

Catalog contains comparison tables, selection data and other helpful information on V-belts for power tools, electric appliances, pumps, and miscellaneous equipment. *United States Rubber Co.*

5. Boring Tools

Bulletin illustrates how Kwik-Size Boring Heads and Arbors are saving time and effort and assuring great accuracy. Head construction permits a number of operations by indexing, without necessitating tool adjustment. *Kaukauna Machine Corp'n.*

6. Casting Machines, Die

Bulletins give detailed information on high pressure, hydraulic, Universal Diecasting Machines: Model 400, with 36"x38" die plates, and Model 200, with 27"x27" die plates. *The Cleveland Automatic Machine Co.*

7. Casting Machines, Die

Four-page folder highlights the advantages of H-P-M Die Casting Machines, including Model 150-A, for high production of sound castings relatively free from porosity, in aluminum or copper base alloys, through cold chamber injection system. *The Hydraulic Press Mfg. Co.*

8. Castings, Malleable Iron

Historical progress of malleable iron castings from buggy days to present is portrayed in unique folder. *Belle City Malleable Iron Co.*

9. Chemicals, Organic

Manual of 98 pages describes the many industrial chemicals, including the new Flovis (starch gel stabilizer), Glycolubes (metalworking lubricants), and Flexo Wax C Light (for screen printing of textiles). *Glyco Products Co., Inc.*

10. Chuck, Gear

Bulletin announces new chuck for job-lot or mass production of bevel gears. It is interchangeable on any machine having draw bar or collet tube. *Garrison Machine Works, Inc.*

11. Containers, and Work Holders

Sixteen-page catalog of containers and work holders for handling parts through heat treating, quenching, pickling, and other processing. Includes baskets, trays, retorts and decarburizing boxes. *Stanwood Corp'n.*

12. Control Systems

Six-page presentation outlines the significance of signal control in production records for graphic presentation of action-facts. *Remington Rand Inc.*

(Continued on next page)

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13. Control Systems

Bulletin describes how Lansing Lectro-Count, a monitoring device, can be of great aid to production control as a permanent tape recorder of production, timed to the minute. *Lansing Engineering Co.*

14. Cooling Equipment, Liquid

The use of the Chrysler-Airtemp packaged liquid cooler for machine tool temperature control is thoroughly described in bulletin. *Airtemp Div'n of Chrysler Corp'n.*

15. Cutters, Milling

Bulletin covers new, improved cutters with carbide tipped inserted blades. Included are shell mills and face mills with simple square shank blades, having no limiting elements. End mills have inserted replaceable blades. *W. T. Howald Machine Works.*

16. Dressers, Grinding Wheel

Wheel dressers, incorporating a number of small diamonds held in matrix of carbide, for faster more accurate truing, are described in 18-page booklet. *Carboloy Co., Inc.*

17. Drill Heads, Multi Spindle

Bulletin offers information on various Adjustable Multiple Spindle Heads for drilling, reaming, tapping, and boring. *U. S. Drill Head Co.*

18. Drives, Electric

Bulletin covers the V*S all-electric, adjustable-speed drives, 40 to 200 HP range, with stepless speed changes, controlled acceleration and deceleration, reversing, jogging, threading and quick stopping, all by convenient pushbutton control. *Reliance Electric & Engineering Co.*

19. Finishing Machine, Precision

Extreme versatility of Bore-Matics, Model 121 Single-End and Model 122 Double-End, in finish boring, turning, facing, chamfering, grooving, or fly cutting, is promised in bulletin. *The Heald Machine Co.*

20. Fixture, Drilling Universal

Bulletin highlights features of Por-Matic air-operated universal drilling fixture, which is easily installed on any drill press. *The Porter Machine Co.*

21. Flexible Shaft Machines

The Rotoflex 4-speed Flexible Shaft Machine, described in bulletin, embodies a new type of quick change gear drive for faster, easier, and more economical production. *N. A. Strand & Co.*

22. Fluids, Cutting

Revised 72-page catalog and manual offers happy solution to many lubrication problems in all phases of metalworking. *D. A. Stuart Oil Co. Ltd.*

23. Fluids and Lubricants

Booklet of 20 pages on several series of the new Ucon group (Polyalkylene Glycols and Derivatives) of fluids and lubricants, their properties and industrial applications. *Carbide and Carbon Chemicals Corp'n. Sinclair-Collins Valve Co.*

24. Forming, Metal

The Cecostamp is an air-operated impact machine on which a wide variety of metal shapes are currently being made, by controlled impact, as illustrated in 16-page booklet. *Chambersburg Engineering Co.*

25. Gages, Comparator

Pneumatic gages that provide unusual economics and precision quality control in high-production are highlighted in 24-page catalog. *Moore Products Co.*

26. Grinder, Small Tool

Booklet illustrates many everyday applications for the Model G3 Grinder and gives detailed descriptive information. *Corlett-Turner Co.*

27. Grinder-Polisher, Contour

Abrasive belt grinding of contoured or straight face surfaces has reached new heights of economy, speed and beauty with the C-6 Belt Grinder-Polisher, according to 80-page bulletin. *Porter-Cable Machine Co.*

28. Grinding Machine, Internal

Toolroom requirements for precision internal grinding are easily met by the new Model 271, which features quick setups and versatility, described in bulletin. *The Heald Machine Co.*

29. Hardening, Flamatic

Exceptional results in selective surface hardening on production work are obtained with the new Flamatic Hardening Machine, which employs electronic surface control. Details given in 20-page bulletin. *The Cincinnati Milling Machine Co.*

30. Hardness Testers

Catalog gives information on the various portable models which offer versatility, economy, simplified use, and accuracy. *Ames Precision Machine Works.*

31. Hydraulic Cylinders

Description, complete mounting dimensions, and other engineering data on leakproof, double-acting and single-acting high-pressure (2000 psi) cylinders are included in bulletin. *Miller Motor Co.*

32. Impact Tool, All-Purpose

Folder describes portable electric rotary impact hand tool which will apply and remove nuts, drill, ream, tap, drive and remove screws and studs, do hole saw work, drive wood augurs, and do many other jobs. *Ingersoll Rand.*

33. Mallets, Nupla

Bulletin lists replaceable tips (soft, medium, tough) for the indestructible Nupla mallets, which will not flare, mushroom, chip, or burn; will not mar polished or delicate surfaces; will not rebound and will retain shape. Also listed are Nylon tips for same mallets. *Acme Tool Co.*

34. Metal Working Case Histories

Brochure of 68 pages offers description and blueprints of 66 jobs that were machined on Natco Drilling, Boring, Facing, and Tapping Machines. *National Automatic Tool Co.*

35. Mills, Midget

Catalog offers complete listing of Midget Mill Group, including High Speed, Junior, Lab, Carbide, Die, and Fin Mills, also the new Micro-Mills. *Severance Tool Industries, Inc.*

36. Models, Plant Layout

Catalog lists standard ⅛" scale models of chemical, process, machine shop, and materials handling equipment; graph planning boards; and clear lucite buildings. *Visual Production Planning, Inc.*

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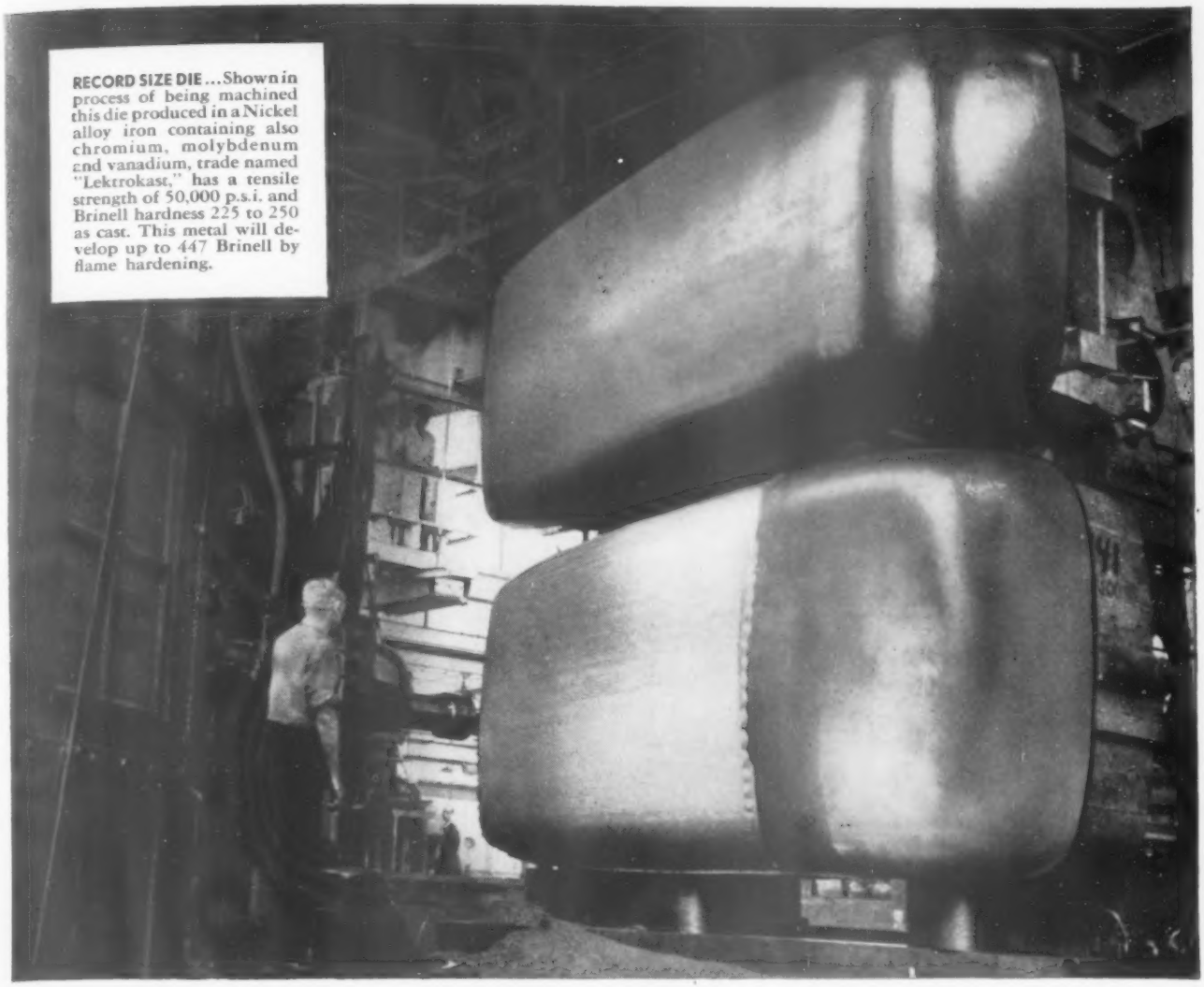


RECORD SIZE DIE...Shown in process of being machined this die produced in a Nickel alloy iron containing also chromium, molybdenum and vanadium, trade named "Lektrokast," has a tensile strength of 50,000 p.s.i. and Brinell hardness 225 to 250 as cast. This metal will develop up to 447 Brinell by flame hardening.

Ever see a Cast Iron Die as LARGE as this?

Believed to be one of the largest ever produced, this huge die for pressing out turret tops was made by the Detroit Gray Iron Foundry Company.

Cast in Nickel alloyed iron, dies of this type are not only strong but provide high machinable hardness that permits greatly increased output between dressings.

Free from imperfections and able to take a high polish that minimizes galling, dies of Nickel alloyed cast iron are being used on many difficult forming jobs.

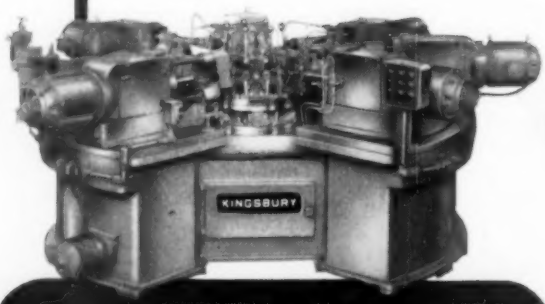
Let our casting specialists consult with you and recommend suitable compositions of Nickel cast iron for your specific applications.

EMBLEM OF INCO SERVICE
TRADE MARK

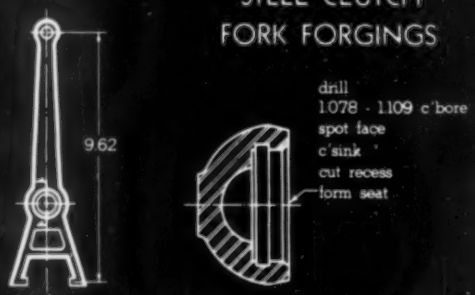
Over the years, International Nickel has accumulated a fund of useful information on the selection, fabrication, treatment and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes and other alloys containing Nickel. This information and data are yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

COMBINED OPERATIONS



STEEL CLUTCH FORK FORGINGS

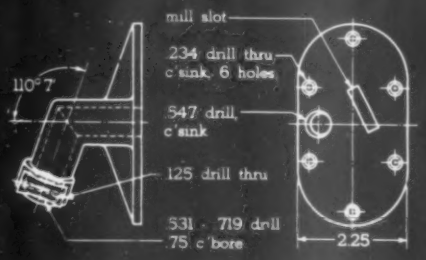


PROBLEM Drill, counterbore, countersink, spotface, form and recess the ball socket with one operator. Operations must be concentric.

METHOD A 20-inch indexing machine provides an easy solution. Eight identical fixtures on the index table hold the parts and present each one in turn to seven drilling units. Operations are concentric because 1) spindles are located to exact indicator readings, 2) plates for tool guide bushings pilot to the fixtures and 3) no part is disturbed in its fixture until finished.

Production rate 200 pieces per hour.

CAST IRON OIL PUMP COVER



PROBLEM Drill, counterbore, countersink and mill from 4 directions with one operator. One direction is 90°-110° away from the others.

METHOD The indexing machine for this job is the central column type that can support several vertical units even at compound angles without interference. All tools are in easy reach as the rear view shows. There are five units on the inside column, one on an outside column and four on a special low base. The 40-inch index table has ample area for the fixtures.

Production rate 246 pieces per hour.

Kingsbury machines feature:

Automatic units Up to 5 hp. Individual speed and cam feed control for efficient operation. Operate at angles. Use multi-spindle auxiliary heads for operations of about equal size and depth.

Accurate location Spindles located to exact indicator readings. Plates for tool guide bushings pilot onto fixtures.

Reduce costs Increase output per man-hour. Reduce handling. Save space.

Uniform product Unvarying work cycle. All fixtures on index tables exactly identical and located to ±.0002.

Operations in exact relation No part disturbed in its fixture until completed.

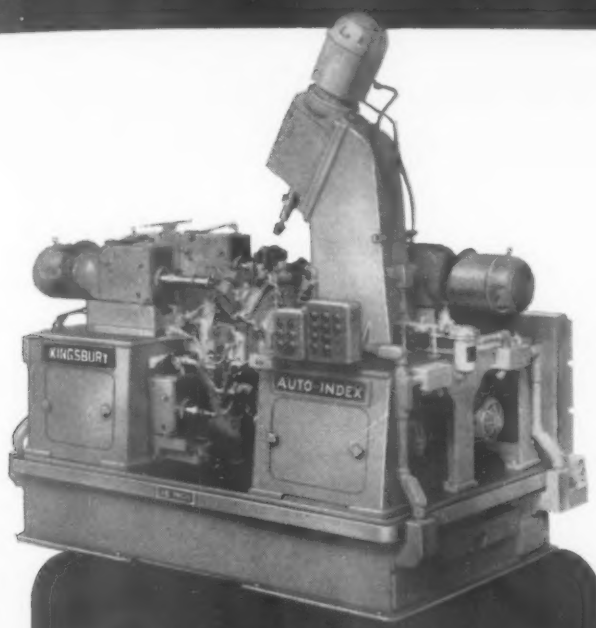
Synchronizing Prevents the index table from moving until every tool is retracted.

Completely tooled Ready for use.

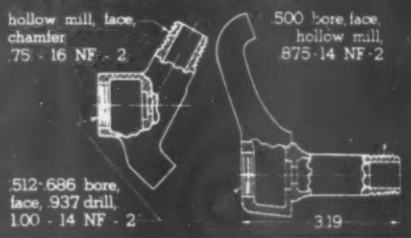
Electrical installation Complies with Machine Tool Electrical Standards.

Rugged construction Will do accurate work for years at intense production. Wear parts of heat-treated alloy steel. Preloaded precision spindle bearings. Gears induction-heated and shaved. All castings normalized before machining.

for HIGH PRODUCTION



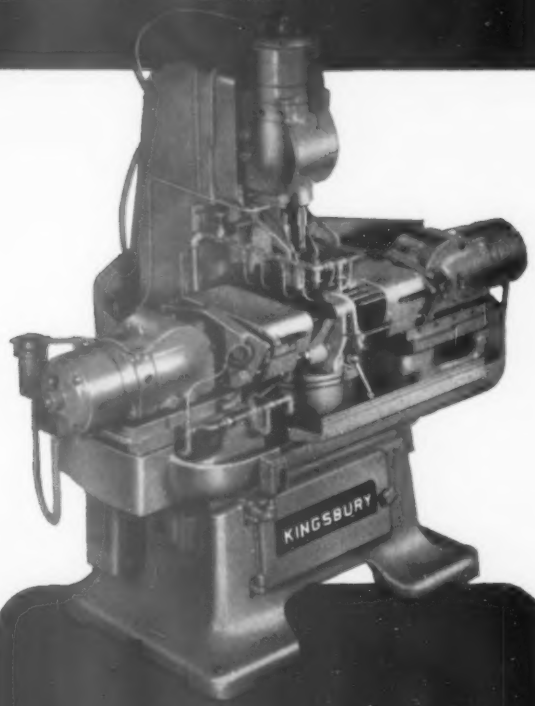
BRASS FAUCET CASTINGS



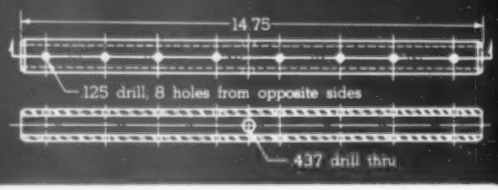
PROBLEM Rough and finish bore, face, hollow mill, drill and tap 120° apart on one faucet and 180° apart on another with the same machine.

METHOD Here indexing is vertical so that the drilling and tapping units can operate from opposite directions. Four units on the left side perform the operations common to both parts. Three units on the right work on the opposite end of the faucet shown on the right. Two units, one on an angular column and one on a rear knee (hidden), complete the 120° faucet.

Production rate 505 pieces per hour.



STEEL SHAFT FOR TRACTOR ENGINE



PROBLEM Drill eight holes in line from opposite directions and another hole 90° away with one operator. Locations must be accurate.

METHOD Each hole has only one operation, so all tools operate together on the same part. There is no indexing. Two opposed units with 8-spindle auxiliary heads drill the .125 holes. The fixture contains their drill guide bushings. A vertical unit drills the .437 hole. Its bushing plate pilots to the fixture and then pulls up to make room for unloading and loading.

Production rate 160 pieces per hour.

Many types of basic machines in our line enable us to solve many kinds of problems, large or small, in combined operations for high production.

Free bulletins show 40 setups.

For free proposals send prints showing operations and required hourly output to Mr. L. A. Carll, Kingsbury Machine Tool Corp., 60 Laurel St., Keene, N. H. 77

KINGSBURY MACHINE TOOL CORP., KEENE, N. H.

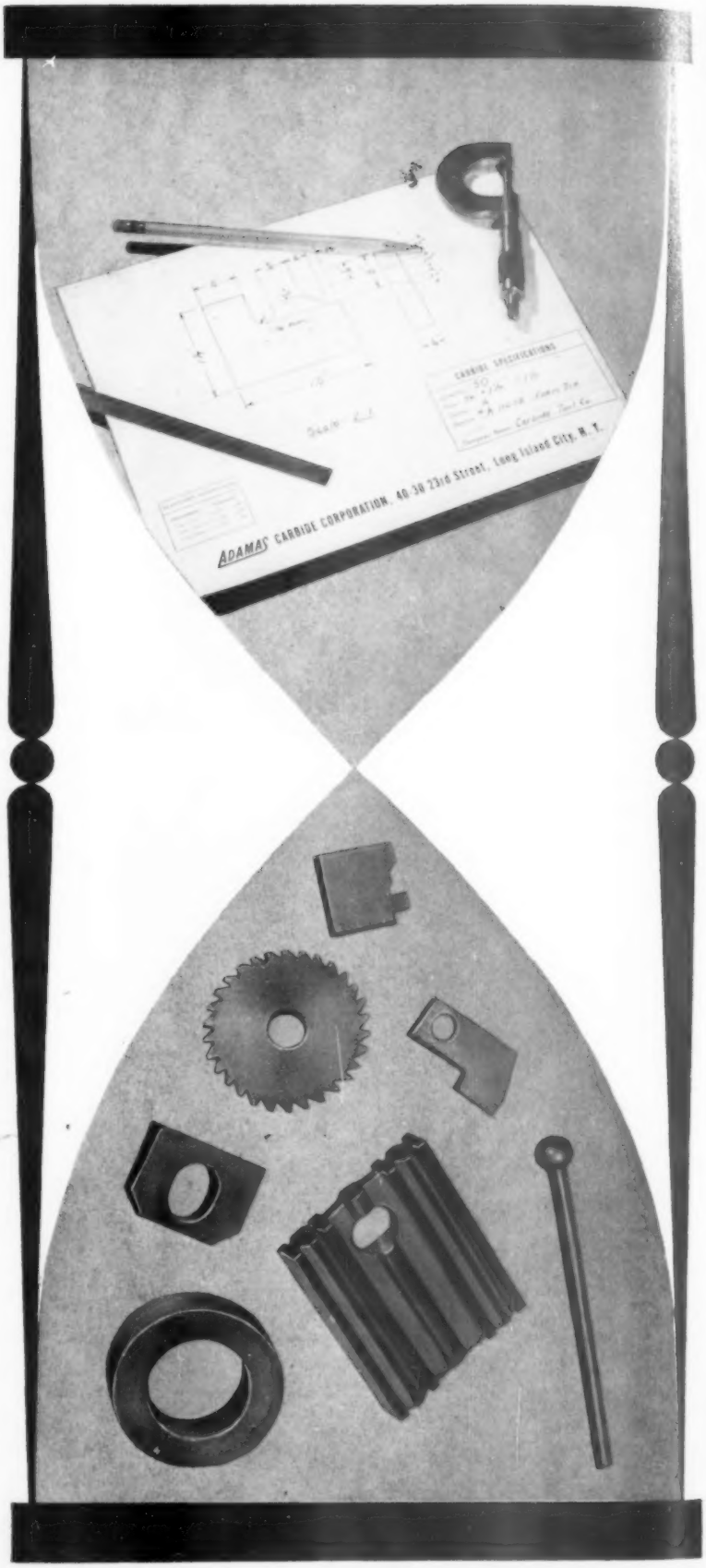
KINGSBURY

Carbide Users:

Time...

and time again...

Time is all important in maintaining your production schedule. Adamas is continually filling the everyday need of industry for immediate delivery on a top quality carbide.
Adamas standard and special blanks have a wide range of applications—from the experimental problems of jet propulsion to the high production headaches of the automotive manufacturers.
Time and time again production problems are being solved and schedules met with Adamas tungsten carbide job engineered grades.
Adamas deliveries on specials, preformed to specifications, are **averaging under one week.**

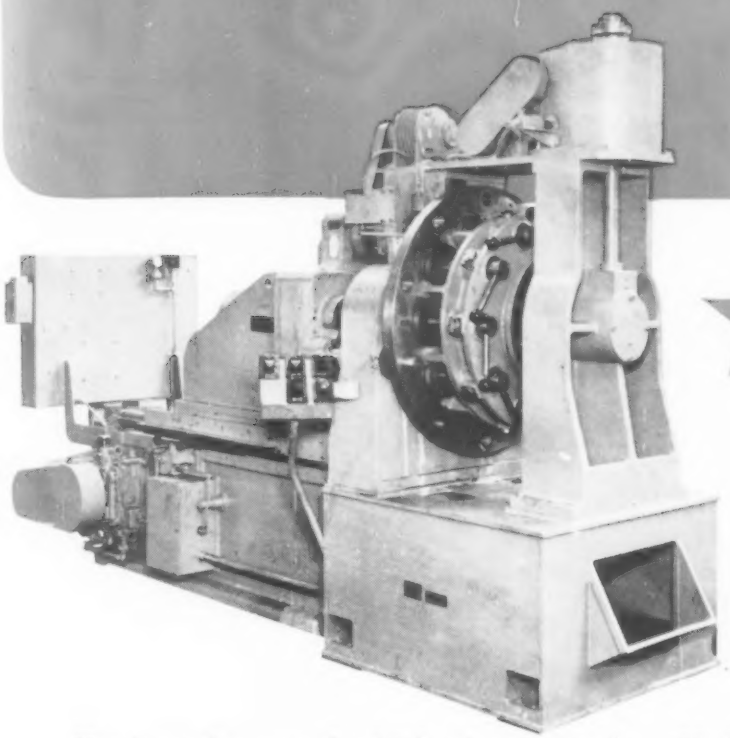


Write for the latest of the Adamas "Aids to Carbide Users", Braze and Save, the illustrated booklet detailing the best method of brazing carbide tool tips and wear resistant parts.

ADAMAS CARBIDE CORPORATION
40-30 23rd STREET, LONG ISLAND CITY, NEW YORK
Producers of top quality carbide for cutting tools, dies and wear resistance—both standard and special

Again BAKER does it Better

...Increases Productivity!

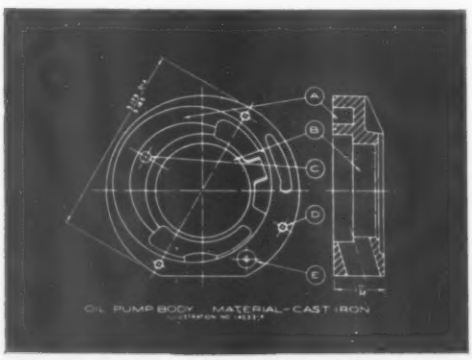


★ One Way Machine

HANDLES MULTI-OPERATIONS AT ONE CHUCKING

Here's another example of Baker ingenuity and know-how simplifying production—making possible increased output per man and per machine!

This Baker Machine is a Model 3½ x 24 Floor Type Hydraulic Feed Unit built into a one-way Multi-Spindle with rotary index trunnion fixture. The part handled is an oil pump body. Machine is designed to perform all operations at one chucking, part not leaving fixture until all operations at each station are performed. Saddle carrying accurate multi-spindle head mounted on bars. Automatic power index to trunnion fixture. Consult with Baker concerning your productivity-problems.



NOTE ECCENTRIC PATH MACHINING

Here is the sequence of operations on the oil pump body shown at left at the ten stations of the machine:

Station No.	Operation
1	Load and unload the part.
2	Rough out Eccentric Pathway "A".
3	Semi Finish Eccentric Pathway "A".
4	Rough Bore and Rough Counterbore "B".
5	Semi Finish Bore and Semi Finish Counterbore "B".
6	Spot Drill .500" diameter one hole "E". Chamfer 5/16" diameter three holes "D".
7	Drill 15/32" diameter one hole "E".
8	Drill .2656 diameter one hole "C". Drill ¼" diameter one hole "E". Drill .2631 diameter three holes "D".
9	Ream .500" diameter one hole "E". Tap ¼"-20NC with Lead Screw Tapper three holes "D".

BAKER BROTHERS, Inc. TOLEDO OHIO

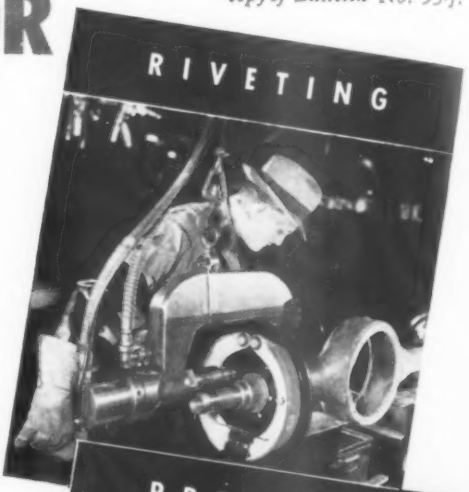
DRILLING . . . TAPPING . . . KEYSEATING . . . CONTOUR GRINDING MACHINES

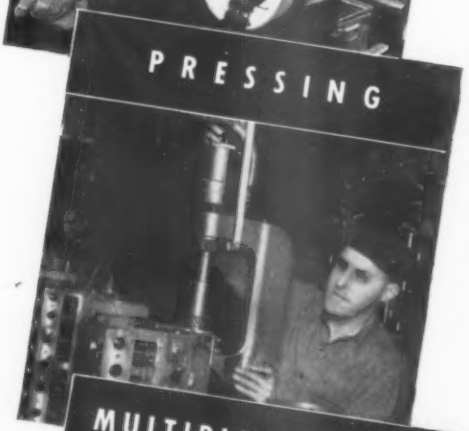
HANNIFIN

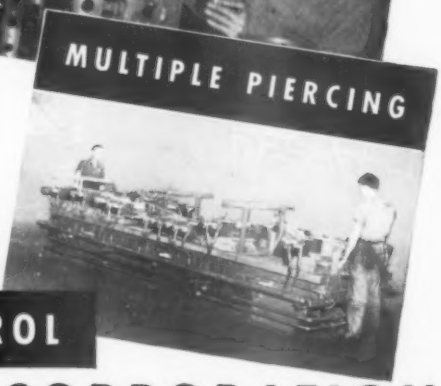
"hy-power" HYDRAULIC UNITS FOR

Hannifin's exclusive "Hy-Power" Hydraulic Pressure Generator. Ask for a copy of Bulletin No. 53-J.

FAST!
EFFICIENT!
PORTABLE!







FOR prompt, dependable help in getting tooled up for efficient production, use Hannifin "Hy-Power" Hydraulic Units.

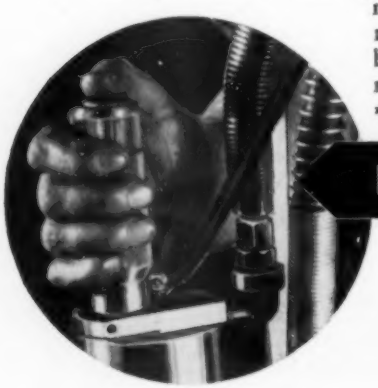
COMPLETE LINE—Portable and stationary types. Standard and special designs available for riveting, pressing, punching, piercing, crimping. Dies for every purpose. Capacities to 100 tons; reach to 6′ or more.

FAST—Time cycle for standard riveters ranges from 1½ seconds to 3 seconds for 3″ or 4″ stroke units.

EFFICIENT—More work with less effort, no noise. Easy to maintain almost unbelievably high production rates. Low power costs. Every operating convenience.

PUSH BUTTON CONTROL—A single push button* gives you complete control. Hold button down and riveter goes through one complete cycle automatically: rapid advance stroke at low pressure . . . short power stroke at full pressure . . . automatic return to starting position. To repeat cycle, release and again depress button. For instant safety at any point, release button and ram retracts.

*Foot control also available.



PUSH BUTTON CONTROL

HANNIFIN CORPORATION

1101 S. Kilbourn Ave. HANNIFIN Chicago 24, Illinois

AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

Nationwide Sales and Service

A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
Getting Authentic Information

ANSWER BY
CARBORUNDUM
TRADE MARK

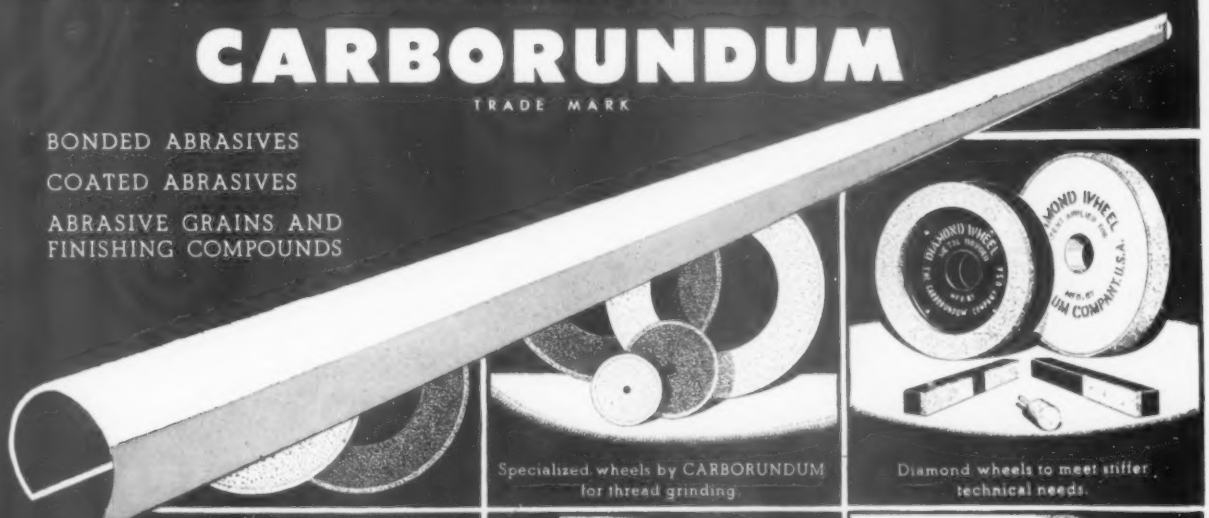
Being so closely identified with the development and progress of abrasives, it is natural that The Carborundum Company should be the source of so much authoritative literature on their application, care, and handling. Certain highly successful concerns regard the helpful service of technical and engineering literature supplied by The Carborundum Company as a significant point in their preference for abrasives by CARBORUNDUM. Ask your Carborundum representative for literature and bulletins related to your own grinding and finishing operations. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
TRADE MARK

BONDED ABRASIVES

COATED ABRASIVES

ABRASIVE GRAINS AND FINISHING COMPOUNDS



Specialized wheels by CARBORUNDUM for thread grinding.

Diamond wheels to meet stiffer technical needs.

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company.

Cool-cutting green grit wheels for cemented carbide.

A coated abrasive for every sanding and finishing condition.

All standard shapes are supplied in grinding wheels by CARBORUNDUM.

Gears & Involute Splines
Included Angle Splines
Cams and Over-Running Clutches
Sliding Clutches
Special Forms
Toothed Parts
Special Forms
Ratchets
Straight Sided Splines
Inverted Splines
You can cut
SHAPES LIKE THESE
faster, more accurately, at lower cost
ON THE MICHIGAN
SHEAR-SPEED*
SHAPER
a gear shaper, a contour former,
an external broaching machine
Ask for Bulletin No. 1800-47
MICHIGAN TOOL CO.
7171 E. McNICHOLS ROAD • DETROIT, 12, U. S. A.
*TRADE MARK

For accurate drilling, tapping, and reaming use UNIVERSAL DRILL BUSHINGS

Your production drilling, reaming, and tapping work goes ahead *smoothly and efficiently* when you put Universal Drill Bushings on the job. These are the precision manufactured bushings with super-honed bores that have been *the first choice of industry* since the founder of Universal Engineering Co. originated standard drill bushings nearly 30 years ago.

You get *more accurate work*—you *greatly reduce costly tool breakage* when you use Universal Drill Bushings... available in standard and special types and sizes. For prompt delivery, and for information on any tools in the complete Universal line, address your orders and inquiries to the Universal warehouse nearest you—89 Main St., Ansonia, Conn., or 5629 Sixth St., Kenosha, Wisc.—or write direct to our home office.

UNIVERSAL ENGINEERING COMPANY • **FRANKENMUTH, MICHIGAN**

Speed-wet* Discs Cut Faster...Longer

because they're 3 ways better

"30% Faster" . . . "production 4 to 1 better" . . . "lasts 5 times longer" . . . never before have so many people expressed so much praise for any disc we ever made.

Technically, the secret of the extra cutting speed and long life of Speed-Wet Discs lies in the balanced combination of three quality features: heat-set resin bonding for resistance to heat; all-fibre backing for extreme flexural strength; and all-Durabonded* coating for rugged grit anchorage.

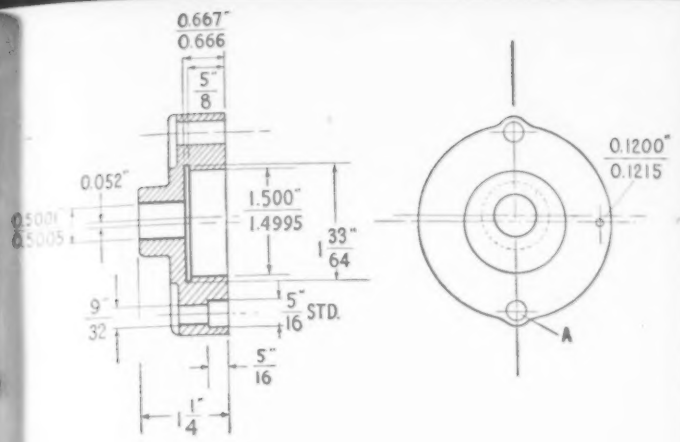
An on-the-job test in your own plant will prove to you the increased production performance of Speed-Wet Discs. We'll be glad to arrange it at your convenience—just write us on your company letterhead.

* *Reg. U. S. Pat. Off.*

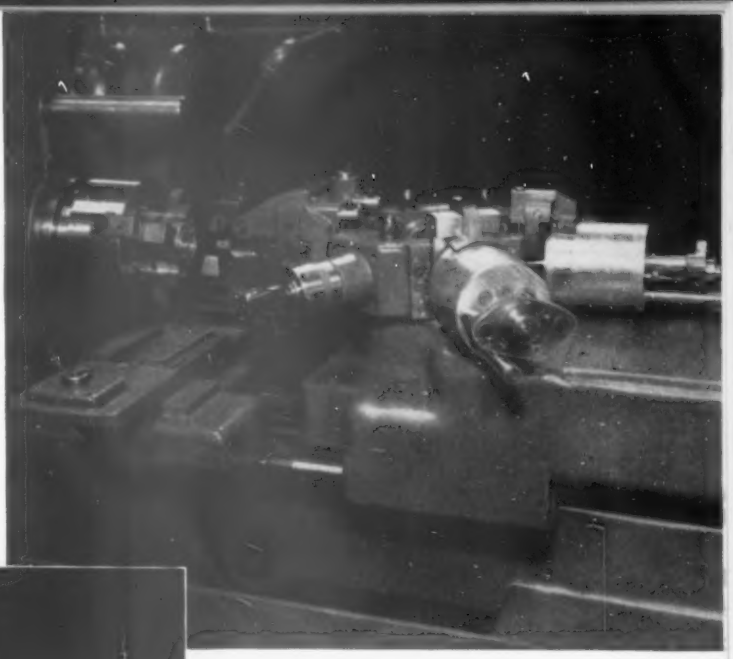
- *All Resin Bonding*
- *All Fibre Backing*
- *All Durabonded Coating*

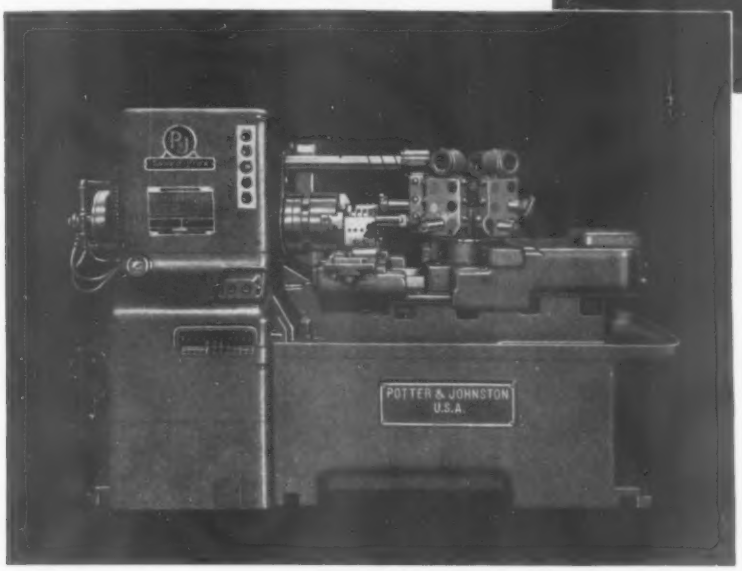
watch for SERVICE PACKAGING

BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.



THE PART... *cast aluminum oil seal cover with eccentric hole at center and flange holes at edge*





THE METHOD... *pieces are chucked concentrically in fast-running P & J spindle, eccentric and flange holes being drilled and reamed by ingenious drill heads driven from the spindle and held in exact relation to the work.*

THE MACHINE.....

POTTER & JOHNSTON'S COMPLETELY NEW

3-U SPEED-FLEX

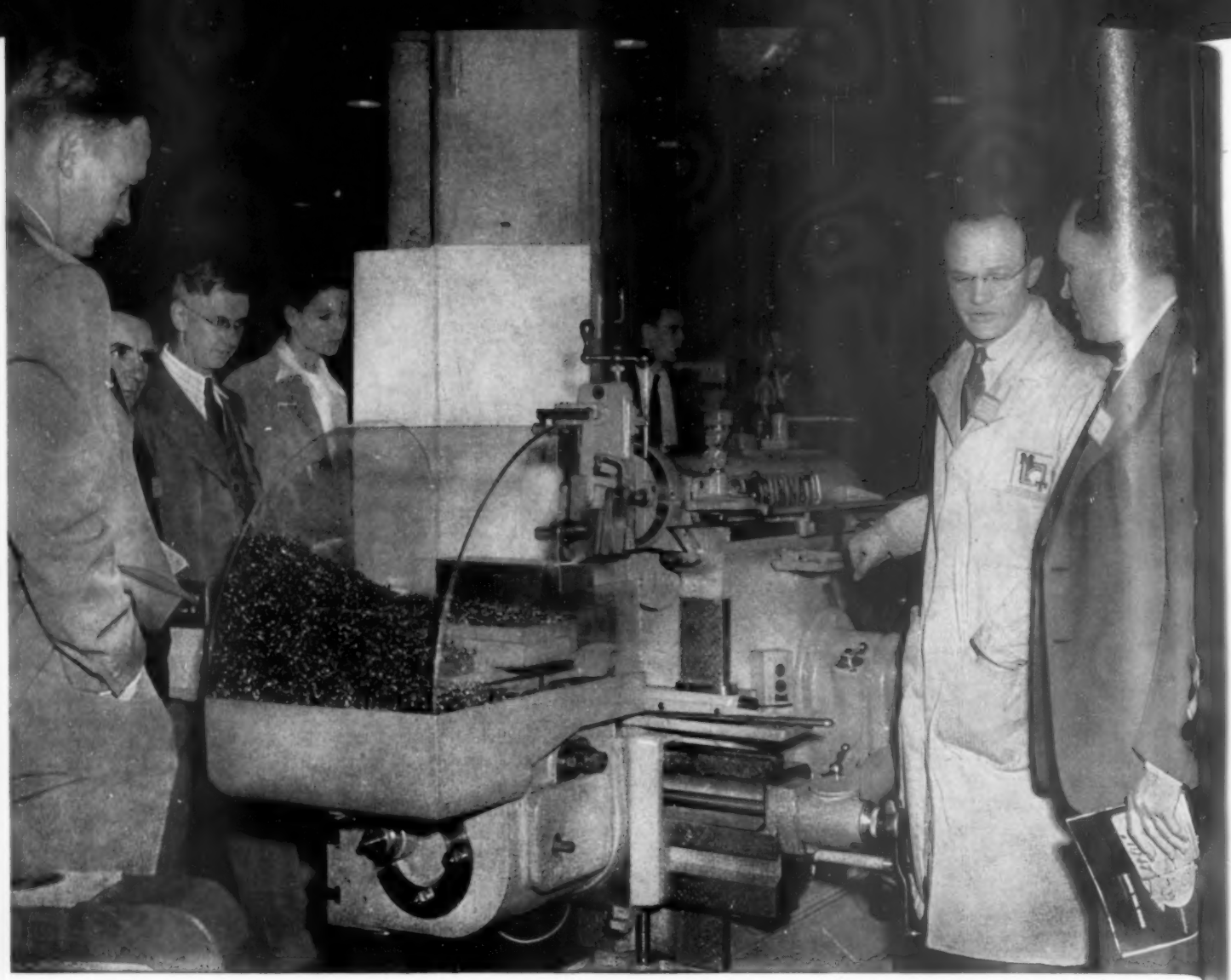
AUTOMATIC TURRET LATHE

Here is a typical story of successful Potter & Johnston tool engineering based on our years of experience in solving a tremendous variety of customers' problems. Faced with the tough one of machining, *without secondary operations,* the aluminum oil seal cover shown above, P & J engineers recently worked out a method in the new 3-U Speed-Flex which does this job — *without rehandling*—in 1.8 minutes including chucking time.

Two special drill heads (center and right in photo at top) are the main features of this setup. When the turret brings these heads into operating position, a drive rod connects them with the spindle, whereupon they revolve in step with the work piece. This in turn revolves their four cutting tools through compact planetary gearing. All the "off-center" holes thereby are drilled and reamed to exact specifications. Concentric operations, of course, are handled with equal facility at other turret positions, at speeds as high as 1445 R.P.M.

We present this example of P & J special tooling not because it necessarily suits any job which you have, but rather because it demonstrates P & J ability to create tooling which will handle your tough jobs on the new 3-U Speed-Flex with unrivaled speed, accuracy and efficiency.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R.I.



*Demonstration at Machine Tool Show, Chicago

CARBIDES PAY ... with the CINCINNATI TOOL LIFTER ...on CINCINNATI SHAPERS

The rigidity that dampens vibration; the power for the toughest steels; the speed for thrifty carbide performance—all are found in Cincinnati Heavy Duty Shapers.

Whether it's alloy steels, chilled castings, chipper blades, or glass molds—carbides on Cincinnati Heavy Duty Shapers are cutting manufacturing costs.

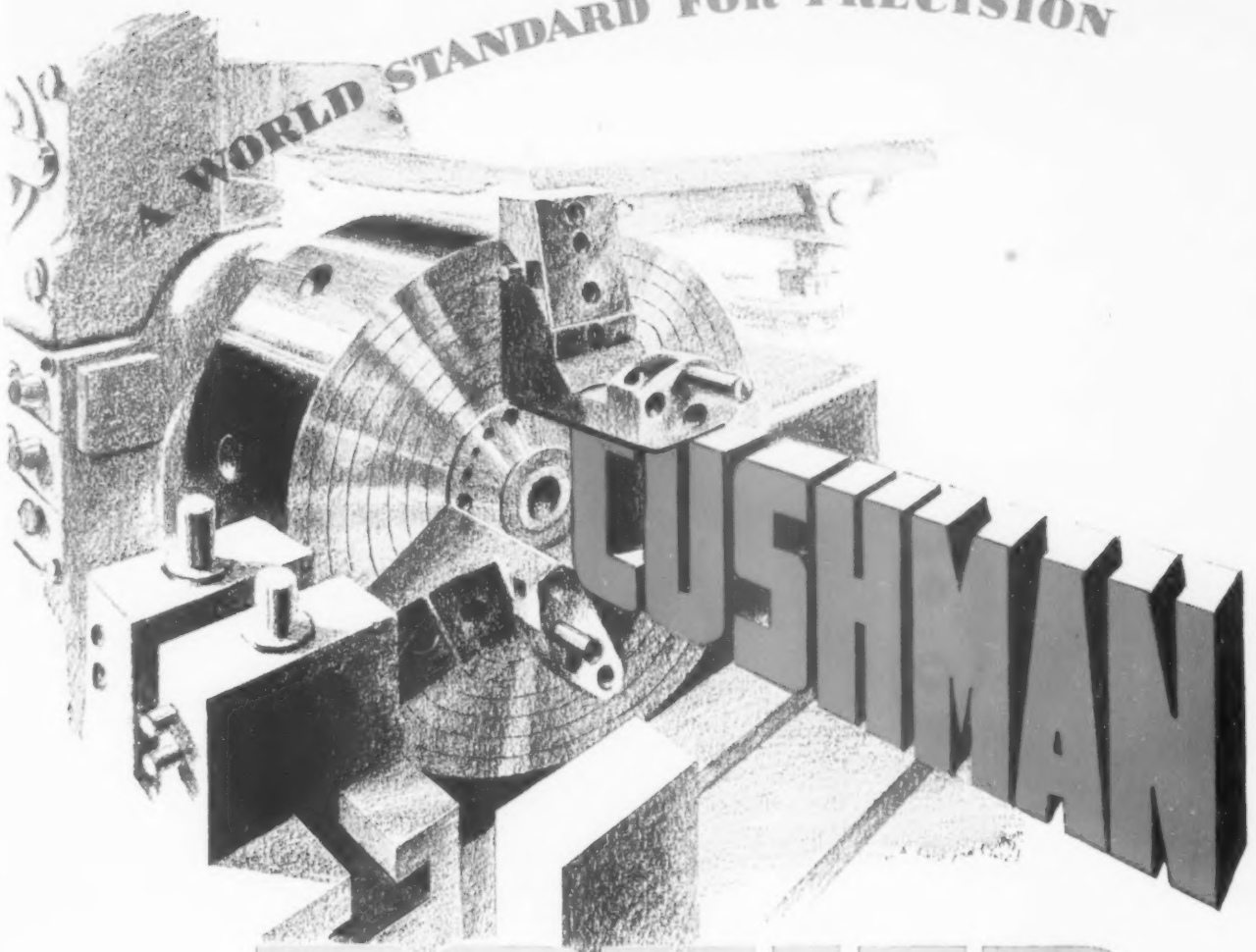
*This Cincinnati Shaper, equipped with a Cincinnati Tool Lifter and carbide tools, operated steadily at 200 strokes a minute at the Machine Tool Show in Chicago. During this ten-day demonstration the shaper was producing a superior finish—quickly and efficiently—on Heppenstall grade B die blocks.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

A WORLD STANDARD FOR PRECISION



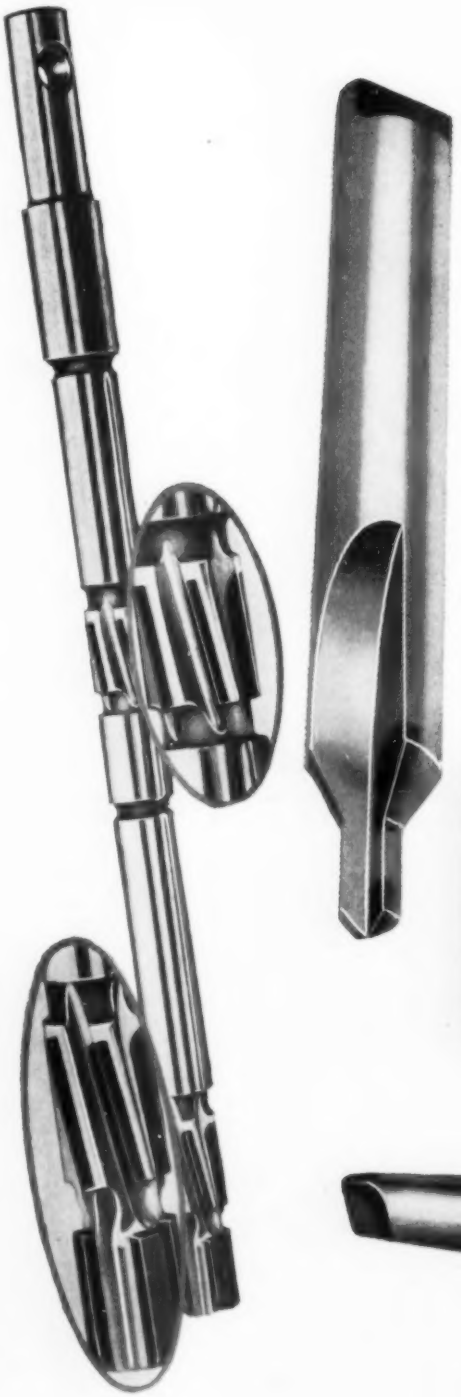
CUSHMAN

POWER CHUCKS

WRITE FOR CATALOG PO-62

THE CUSHMAN CHUCK COMPANY
HARTFORD, CONNECTICUT

CARBIDE-TIPPED TOOLS *with* HIGH-SPEED STEEL BODIES ARE TOPS IN STURDINESS AND CUTTING EFFICIENCY!



THE combination of carbide tips and high-speed steel bodies makes possible a new "high" in cutting tools —greater efficiency, reduced production costs and longer tool life.

The high-speed steel body makes the tool much sturdier than ordinary cutting tools, enabling it to turn-out work with greater accuracy, thereby reducing spoilage losses.

Its extreme hardness also results in less wear on the flutes and pilots, practically eliminating both scoring and pick-up, and making the tool last much longer.

If you want top performance in cutting tools, you can be assured of it by changing over to carbide-tipped tools with high-speed steel bodies. (They cost no more and give you more for your money.)

Our engineers will be glad to work with you on your problems

SUBLAND REAMERS • LINE REAMERS • CENTER DRILLS

Write for QUOTATION

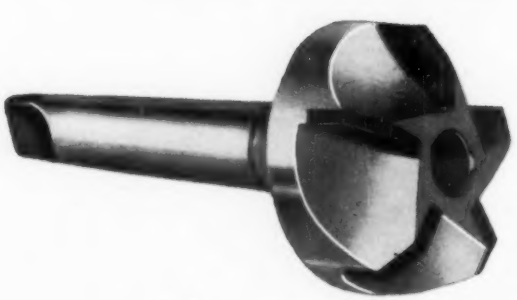
COUNTERBORES • CORE DRILLS • END MILLS

Special Tools To Your Specifications

DETROIT REAMER & TOOL CO.

2830 E. Seven Mile Road — Detroit 12, Michigan

Manufacturers of Oil-Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, (High-Speed or Carbide-Tipped) -Also End Mills and Special Tools



VICKERS Variable Speed HYDRAULIC TRANSMISSION

1/2 Horsepower

(PATENTED)

PRICE $75.00

Here is a compact, sturdy, variable speed hydraulic transmission for machinery drive. Any speed from zero to 1750 rpm—*in either direction* can be obtained without reversing the driving motor.

Effortless finger tip speed adjustment over the entire range is obtained by the handwheel control and the selected speed remains constant. A hydraulic servo control mechanism is also available. The full output torque is available throughout the speed range and the built-in automatic overload protection permits stalling without causing damage.

The Vickers hydraulic transmission is automatically pressure lubricated by the power transmitting medium (oil) for long and trouble-free operation.

Contact the Vickers Sales Engineering and Service Office nearest you for complete information.

ASK FOR BULLETIN No. 47-40

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1416 OAKMAN BOULEVARD • DETROIT 32, MICHIGAN

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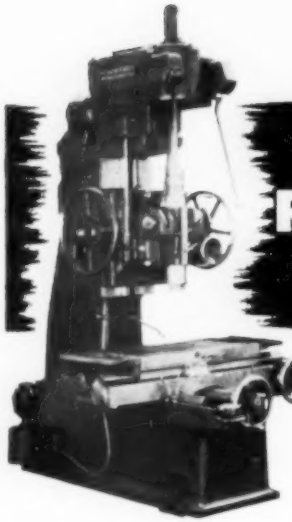
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Photo Courtesy:
Fosdick Machine Tool Co.
Cincinnati, Ohio



A RUTHMAN PUMP

to speed production
cut maintenance costs
give long service

Instantaneous coolant flow, split-second control from a trickle to full volume, speeds production in your metal-cutting operation. Pre-lubricated over-sized bearings, one-piece dynamically balanced shaft, no metal-to-metal contact reduces wear and assures long trouble-free service for Ruthman Gusher Coolant Pumps.

Designed on centrifugal principles, Ruthman Pumps fit a wide variety of circulating pump problems.

Illustrated is a Fosdick No. 30 Jig Borer equipped with a 1/4 Model UL-7120 Ruthman Gusher Coolant Pump. Ask for Catalog 10-1

THE RUTHMAN MACHINERY CO.

1810 Reading Road — Cincinnati, Ohio

A SURE *Bet* FOR MISALIGNMENT TROUBLES

Types to fit any machine used for tapping or reaming.

Why put up with misalignment difficulties in tapping and reaming when the trouble can be quickly and easily remedied!

Instead of fretting and fuming, get a Ziegler Floating Holder that automatically compensates for inaccuracies in set-up, even though they amount to as much as 1/32" radius or 1/16" diameter, thus enabling the tool to do a perfect job.

You will find the Ziegler Holder a sure bet for solving your misalignment problems. Try it and see!

W. M. ZIEGLER TOOL COMPANY
1930 Twelfth Street — Detroit 16, Mich.

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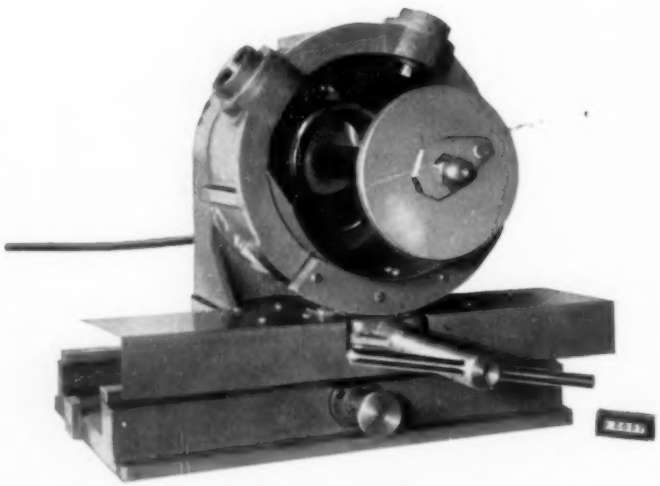
Ziegler ROLLER DRIVE **FLOATING HOLDER** *for* Taps *and* Reamers...

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley Ave. — Detroit, Michigan



A DOUBLE INDEXING FIXTURE TO MACHINE PORTHOLES IN CYLINDER BARREL UNDER TWO SPINDLE GANG DRILL. CYLINDER ROTATES WHILE MOVING HORIZONTALLY.

-DESIGNERS-
-BUILDERS-

SPECIALIZING IN
ALL TYPES OF
HOLDING FIXTURES
FOR MACHINE SHOP
PRODUCTION

BUILDERS OF STANDARD DRILL JIGS AND FIXTURE LOCKS

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KEEP PRODUCTION at PEAK EFFICIENCY

...with Cutters like this

BECAUSE of the alternate right- and left-hand spiral angles of the teeth, with considerable angle of undercut, this staggered tooth side milling cutter is removing a large amount of metal without destructive vibration and chatter . . . taking deep cuts with *good finish*. Its free cutting action makes possible an increased speed and feed.

This is a typical example of the many installations where the inherent high qualities of Brown & Sharpe cutter design and craftsmanship pay dividends. Write for catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

A Complete Line of MILLING CUTTERS

Plain Milling Cutters — Helical Plain Milling Cutters — Side Milling Cutters — Staggered Tooth Side Milling Cutters — Inserted Tooth Cutters — End Mills — Angular Cutters — Convex and Concave Cutters — Metal Slitting Saws — Screw Slotting Cutters — Sprocket Wheel Cutters — Gear Cutters

We urge buying through the Distributor

BROWN & SHARPE CUTTERS B·S

NEW!

SOUTH BEND

14" Drill Press

South Bend presents this new 14" Drill Press as a companion to the South Bend Precision Lathe. It is built with the same high standards of accuracy and skilled workmanship. Years of painstaking research and experimentation have gone into its design. This has resulted in a superior tool unsurpassed for accuracy, ease of operation, versatility and dependable performance.

FEATURES and SPECIFICATIONS

BELT TENSION RELEASE
Quick-acting belt tension release lever simplifies speed changes. Keeps tension correct.

BUILT-IN LIGHT
Provides shielded illumination for work area. Separate on-off switch.

SPINDLE
Free-floating design prevents misalignment, side thrust, and whip. Travel of spindle . . . . . 4"

BALL BEARINGS
Sealed, precision type. No oiling. 2 on spindle drive unit, 2 on spindle.

QUILL BEARING ADJUSTMENT
Compensates for wear.

DEPTH GAUGE
Graduated in inches. Adjustable collars control feed and return.

RUGGEDLY CONSTRUCTED
Precision-built for industrial and all other types of shops.

TWO MODELS
Cat. No. 400-B bench type.
Cat. No. 400-F floor type.

CAPACITY
Maximum drill size in iron or steel . . . . . ½"
Drills to center of 14" circle.

CHUCK
Capacity . . . . . 0 to ½"

SPEEDS
Four — 707 to 4322 r.p.m.

CHUCK TO BASE DISTANCE
Bench Model . . . . 17"
Floor Model . . . . 46½"

TABLE SIZE
10" x 10" . . . . Tilt Type

COLUMN
2¾" diameter. Accurately ground.

HEIGHT
Bench Model . . . . 35½"
Floor Model . . . . 65½"

SHIPPING WEIGHT
Bench Model . . 195 lbs.
Floor Model . . . 235 lbs.

MOTOR REQUIRED
½ h.p., 1725 r.p.m.
Vertical mounting. On-off switch provided.

$98.00 f. o. b. factory, bench model with chuck, extension cord and switch; less motor.
Floor model $113.00

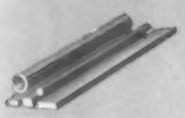
SOUTH BEND LATHE WORKS

BUILDING BETTER LATHES SINCE 1906 · 531 EAST MADISON STREET, SOUTH BEND 22, INDIANA

TO YOU IN * 24 HOURS OR LESS

Talide
(TUNGSTEN CARBIDE)
Cutting Tools

TALIDE METAL MEETS EVERY REQUIREMENT



SOLID BAR STOCK

DRAWING DIES

CENTERLESS BLADES

DRILL JIG BUSHINGS

ROLLING MILL WORK ROLLS

Talide Tools reach you in perfect condition. They are plastic dipped for protection in shipment or storage.

Why wait for carbide cutting tools or tips when they are quickly available from a Metal Carbides warehouse. Fast delivery service of Talide (the hardest metal made) is assured by a call to one of the following warehouses:

Newark, N. J., 166 Bloomfield Avenue.
HUmbolt 2-2004

Youngstown, Ohio, 107 E. Indianola Avenue.
Youngstown 2-8167

Chicago, Ill., 601 N. Milwaukee Avenue.
HAymarket 1071

Talide QUALITY NEVER VARIES

Metallurgical consistency is a feature of TALIDE tungsten carbide. Talide tools give you 25 times the life of steel tools on every order. *Talide metal lasts longer because quality never varies.*

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SINTERED CARBIDES — MC TALIDE — HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

NOW—you can do...

SMALL PRECISION DRILL JOBS

FASTER, EASIER, BETTER WITH A

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Midget Type

SPRING JIG

NO. 1500

Distributors in Principal Cities

New "Nest" Service

We now offer a "Build" service for producing the nests to hold parts in Siewek Jigs for the drilling operation. Customers not equipped to design and build suitable "nests" will find this service economical. A sketch of the proposed nest is submitted with quotation.

Also manufacturers of widely used

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100 STANDARD SIZES CARRIED IN STOCK —

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FULL SIZE TEMPLATE TRACING SHEETS ON REQUEST *FREE!*

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Spring Type • 20 Sizes

Rack and Pinion • 33 Sizes

IMMEDIATE stock delivery of all Siewek Jigs, Clamps and Fittings *Now Possible From*

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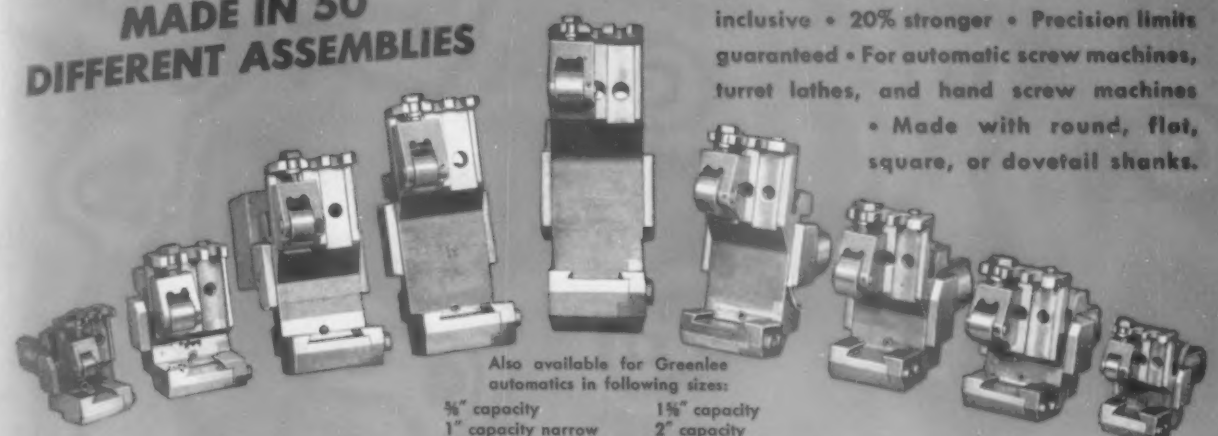
Loose jaw for easy tool removal and to take up variance in sizes • 13 sizes 7/16" to 5" inclusive • 20% stronger • Precision limits guaranteed • For automatic screw machines, turret lathes, and hand screw machines • Made with round, flat, square, or dovetail shanks.



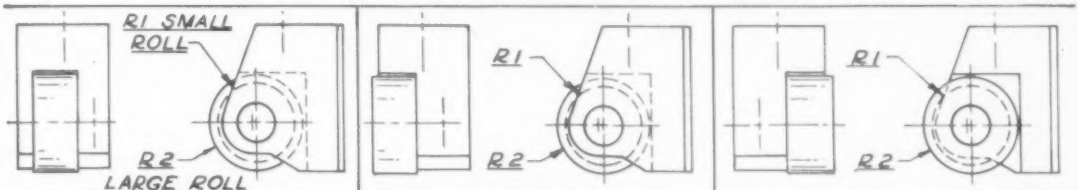
Also available for Greenlee automatics in following sizes:

5/8" capacity	1 5/8" capacity
1" capacity narrow	2" capacity
1" capacity wide	2 1/4" capacity

Now Available in Three Types

Adding New Roller Positions to the Shave Tool Holder

STANDARD ROLLER BACK RESTS



STRADDLE TYPE: MADE FOR ALL SHAVE TOOL HOLDERS - SIZES 7/16" TO 5" INC.

LEFT HAND OFFSET TYPE MADE FOR SHAVE TOOL HOLDERS FROM SIZE 7/16" TO 2 1/4" INC.

RIGHT HAND OFFSET TYPE MADE FOR SHAVE TOOL HOLDERS IN 3 SIZES ONLY - 7/16"; 5/8"; & 1".

FOR RESTRICTED CENTER DISTANCES

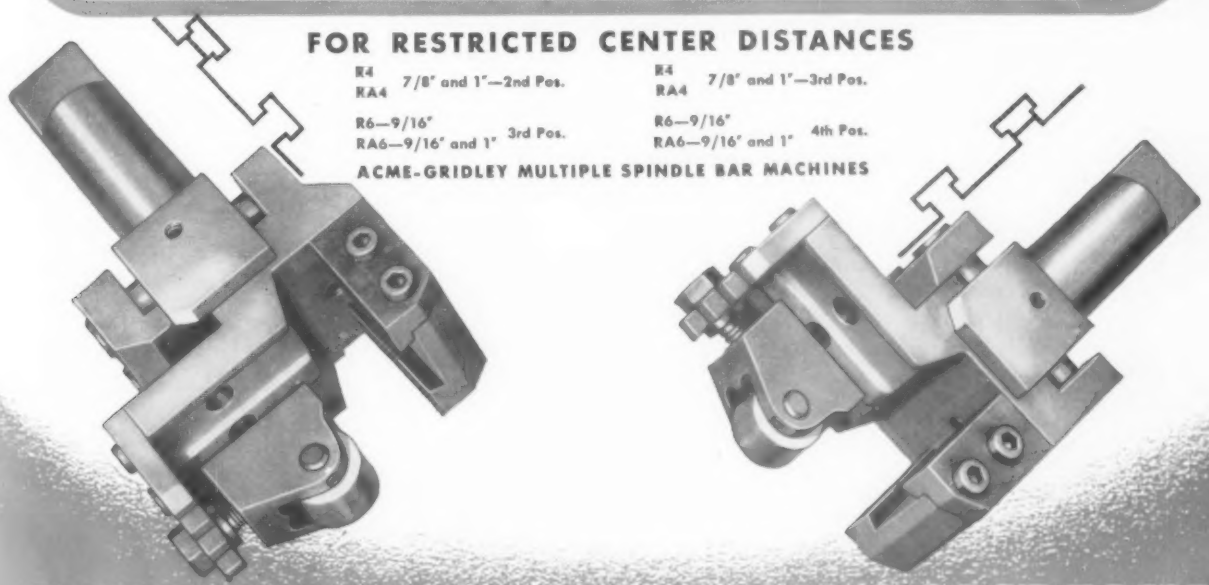
R4 RA4 7/8" and 1"—2nd Pos.

R4 RA4 7/8" and 1"—3rd Pos.

R6—9/16" RA6—9/16" and 1" 3rd Pos.

R6—9/16" RA6—9/16" and 1" 4th Pos.

ACME-GRIDLEY MULTIPLE SPINDLE BAR MACHINES



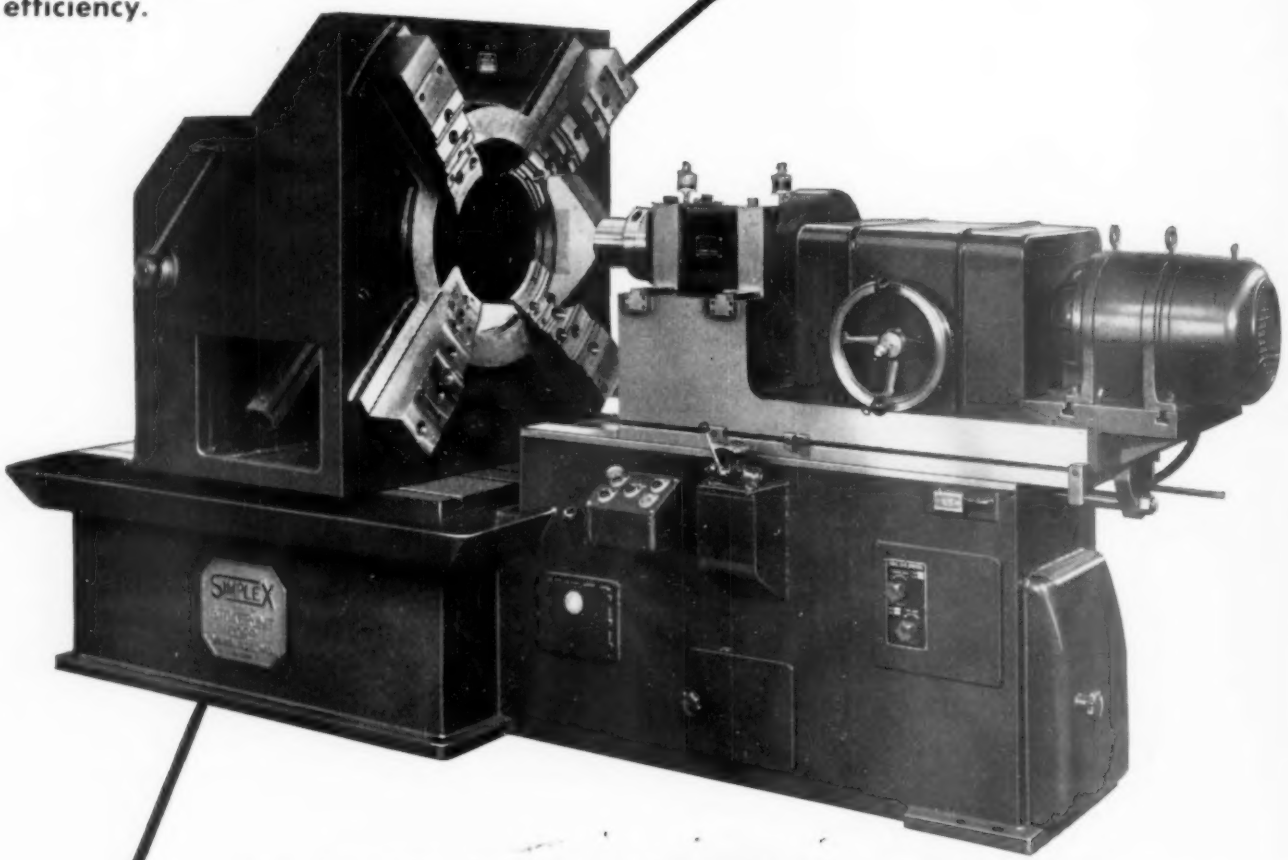
SCREW MACHINE TOOL COMPANY

17565 SWIFT AVENUE • DETROIT 3, MICHIGAN

MANUFACTURERS OF ACCESSORY TOOLS FOR ALL TYPES OF AUTOMATIC SCREW MACHINES

SIMPLEX

ELECTRIC MOTOR END SHIELDS must support rotors rigidly and accurately, yet due to the lightness of the casting, they are usually distorted in machining operations. The precision boring operation on the bearing seat in a multiple step fixture eliminates the inaccuracies and provides for maximum motor efficiency.



The machine shown is a 4U Single-End SIMPLEX Precision Boring Machine with an enlarged work table, a raised gear-driven spindle and a variable speed drive unit to control the boring spindle speed. The fixture is of the quick-clamping, adjustable type locating the part from the previously machined rabbet surface. A wide variety of pieces can be accommodated in a single machine with a minimum of changeover time required from one size end shield to another.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

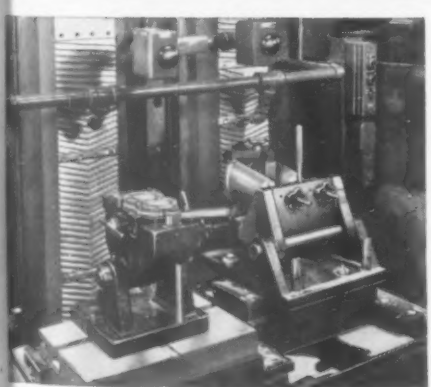
Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

THE JOHNSON SEA HORSE SHOWS HOW

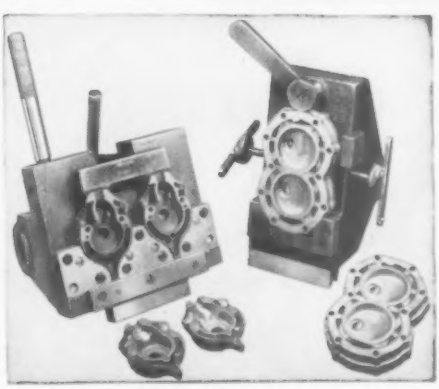
ON OILGEAR SURFACE BROACHING MACHINES

Operator loading twin cylinder head in fixture on Oilgear Double Slide Vertical Surface Broaching Machine. Fixture tilts forward to broaching position.

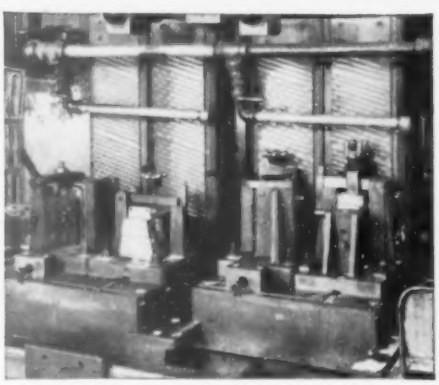
Oilgear Fluid Power



Twin cylinder head loaded on left hand fixture while two other parts in right hand fixture are being broached.



Fixtures and parts for water pump housing and twin cylinder head. Parts are also in loaded position.



Showing wide slab broaching tools that can be applied to Oilgear single and double slide Vertical Surface Broaching Machines.

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BAYFLEX®

Time saver—

money maker—

easier—

faster!—

---write them today!

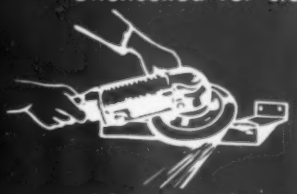
Foundry and metal-fabricating shop operators are overwhelmed with their increased piece work production from BAYFLEX RAISED HUB DISC WHEELS.

Yes, where heavy duty portable grinders and sanders are used the jobs can now be done much faster—easier—cleaner. No wonder that BAYFLEX is so popular with management and operators alike!

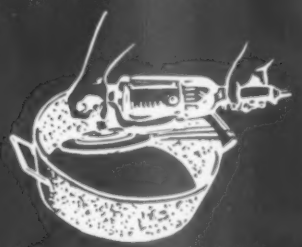
The merits of this new product are many . . . the production possibilities unlimited. To appreciate the full value of BAYFLEX however, you must see it in operation. Ask for a demonstration at your plant. No obligation.

Branch offices and warehouses—
Chicago — Detroit
Distributors — All Principal cities

Unexcelled for cleaning castings.



For welds on angle-iron frames.



For hard-to-get-at places.

Has no equal for smoothing welds.

Hundreds of uses in auto repair shops.

A "MUST" for metal-fabricating shops.

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BAY STATE ABRASIVE PRODUCTS CO.,

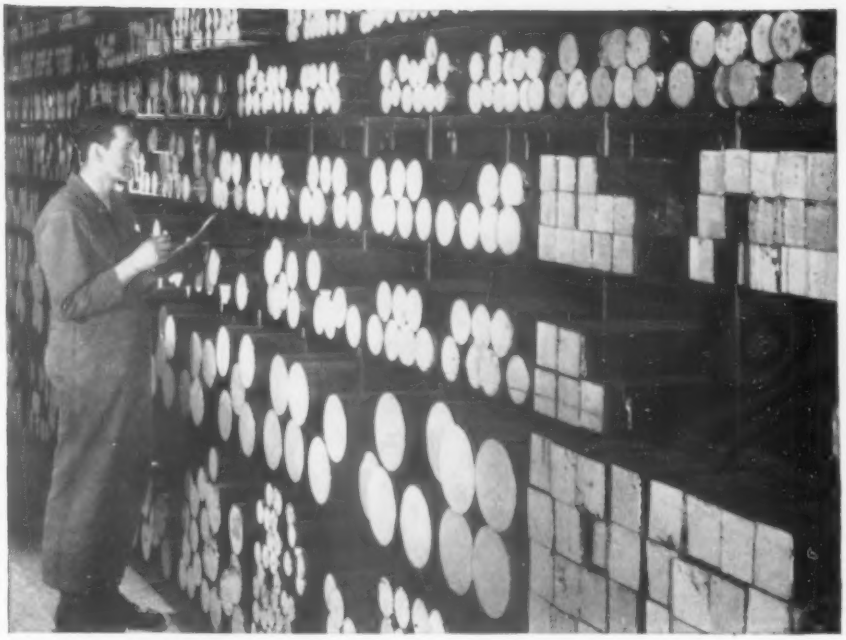
BETHLEHEM *Complete* ★ TOOL STEEL SERVICE

CARBON AND CARBON-VANADIUM TOOL STEELS

OIL- AND AIR-HARDENING TOOL AND DIE STEELS

SHOCK-RESISTING STEELS

HIGH-SPEED STEELS



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BETHLEHEM, PA.

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BETHLEHEM TOOL STEELS for EVERY JOB

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Increased production depends on a satisfactory Diamond Tool. Tool life, speed of cut, increased production depend eventually upon the diamond tool. JKS Diamond Tools are giving entire satisfaction on practically every make of machine tool. 155 types are available for dressing and truing operations. The model illustrated is the STA-KOOL with internal cooling ducts and external cooling fins.

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After a "ROCKWELL" Hardness Tester leaves our Standardizing Laboratory, it is perfectly capable of setting and maintaining its own standard, according to the universally accepted "ROCKWELL" Hardness scale.

Remember, the "ROCKWELL" Hardness Tester is made only by Wilson. And Wilson makes only hardness testers.

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Save with Walker Chucks.
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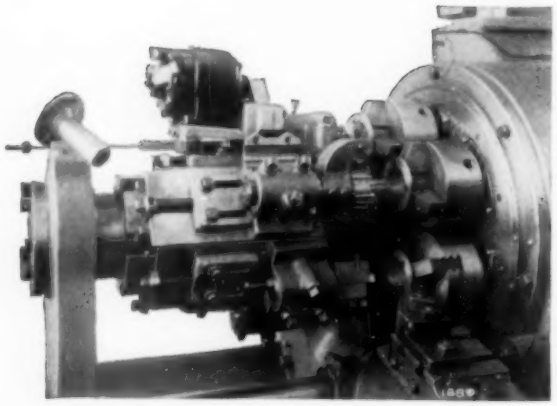
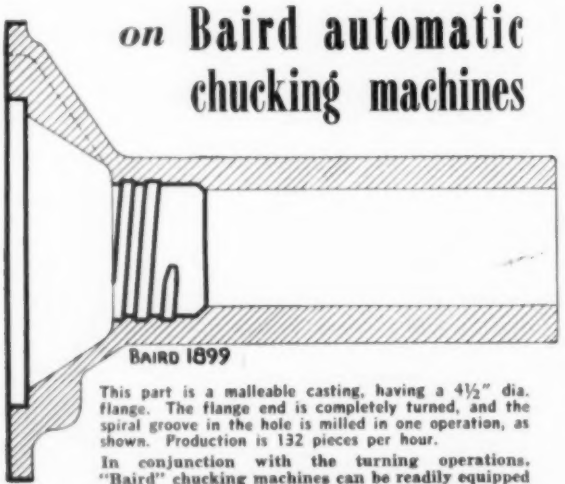


COMPLETE TURNING plus MILLING OPERATIONS

are really accomplished

on **Baird automatic chucking machines**



This part is a malleable casting, having a 4½" dia. flange. The flange end is completely turned, and the spiral groove in the hole is milled in one operation, as shown. Production is 132 pieces per hour.

In conjunction with the turning operations, "Baird" chucking machines can be readily equipped for a large range of varied and special machining operations: including Milling, Multiple Hole Drilling, Tapping, Cross Drilling, etc.

To perform your multiple machining operations profitably "ASK BAIRD ABOUT IT"

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"SPECIALS"

MADE TO YOUR SPECIFICATIONS

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GROUND & LAPPED KNURLS

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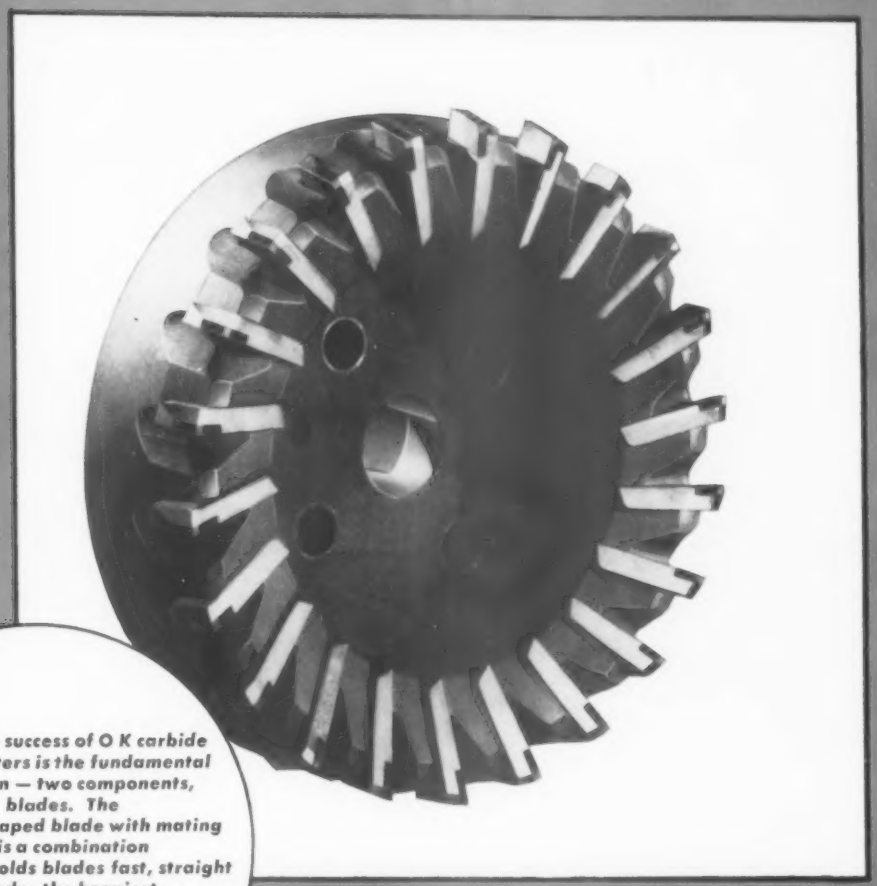
carbide: dual adjustable milling cutters



Back of the success of O K carbide milling cutters is the fundamental basic design — two components, body and blades. The *wedge-shaped blade with mating serrations is a combination lock that holds blades fast, straight and true under the heaviest cuts. No screws, pins, gibs or other locking devices are required!

****The wedge is the world's simplest and strongest basic mechanical device.***

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OK milling cutters

The O K Tool Company, Inc., Shelton, Conn.

THE *Van Keuren* simplified

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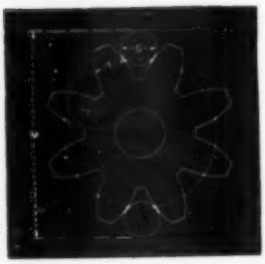

is the most accurate and economical method of measuring tooth thickness of external and internal spur gears. Also it may be applied to helical gears.

◀*External Spur Gear*

STANDARD SIZES OF WIRES ARE AVAILABLE FROM STOCK

1.728"/DP for external spurs
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Catalog No. 33 is a manual of precision measuring systems, giving complete tables and simplied formulas for measuring standard and special threads, splines, spur gears, helical gears and worms. Send for Catalog 33.

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MIDGET MILLS - ¼" Shanks

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TEN LEADERS

MORE THAN 20 SHAPES—EACH IN SEVERAL SIZES

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Practical for use on small grinders, for finishing Patterns, Dies, Parts, etc., in places difficult to reach with the larger Mills.

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These speedy Mills for Dental Laboratories find many uses in Jewelry and in Die and Mold making. Available in 10 popular shapes in 4 or more sizes each, for the finest cutting and finishing. May be reground up to 8 times per 1/32" reduction in diameter

HIGH SPEED
Out-Perform Dental Burs and Grinding Points

ACTUAL SIZE

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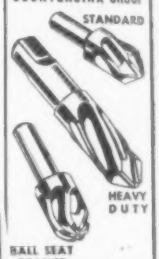

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Get EXTRA strength on EXTRA TOUGH JOBS with SQUARE HEAD SET SCREWS!

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Is your company ready for a leading role in the most important and spectacular show ever presented by ASTE? Don't forget your competitor will most likely be on the scene. Don't let him steal the show. There's still time to reserve excellent space for your exhibit.

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ASTE's last Exposition drew thousands of top executives, industrial engineers and tool engineers . . . the very men who *dictate the purchase and can specify your product for their plants.*

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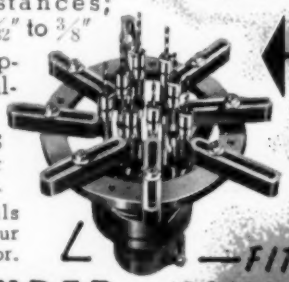
Model 900



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Shows you which blocks, if any, are inaccurate and how much. Issued with each inspection.

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Must be BAY STATE!

Standard Quality makes them a Quality Standard

On Nearby Shelves of Industrial Supply Distributors.

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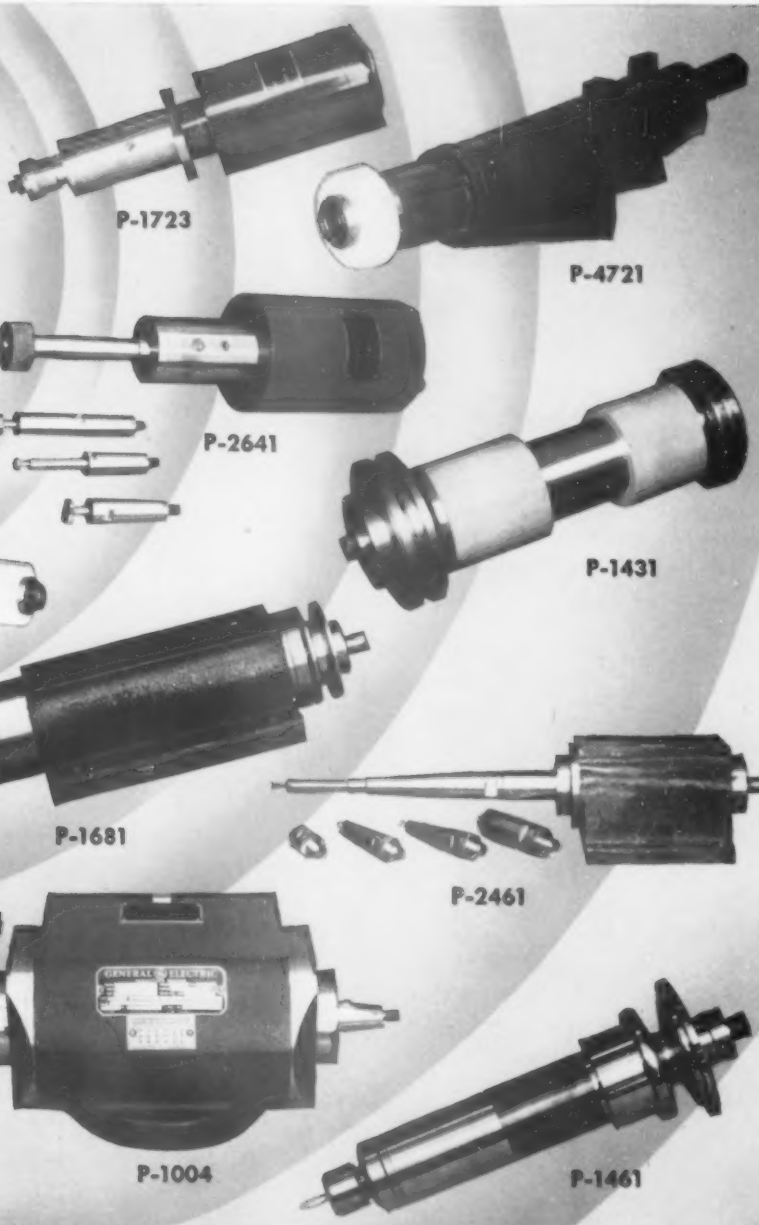
POPE
PRECISION SPINDLES
with Sealed Lubrication



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***YOU* Name The Job. Then, Let POPE Design And Build The One Best Spindle To Do It!**

Recommendations and estimates will be promptly furnished.

No. 48

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ESTABLISHED 1920

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BUILDERS OF PRECISION SPINDLES

GOOD ENGINEERING

.is the shortest path between two points

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the Answers

TO INDUSTRY'S PROBLEMS

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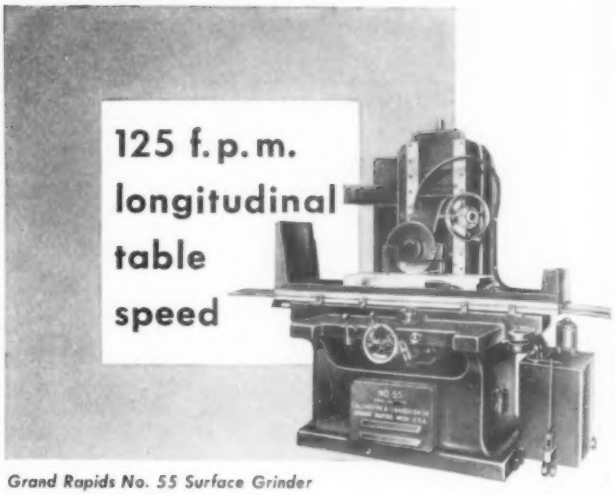
PIONEERing Better Production Methods and Tools



Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

Write for Bulletin GL-101

GALLMEYER & LIVINGSTON COMPANY

Manufacturers of Grand Rapids Grinders

110 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

Columbia TOOL STEEL

TEN RULES FOR GOOD TOOLS—

Columbia's new 1948 calendar presents a formula for "good perishable tools and dies.

Calendars will be sent on request on company letterhead.

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT

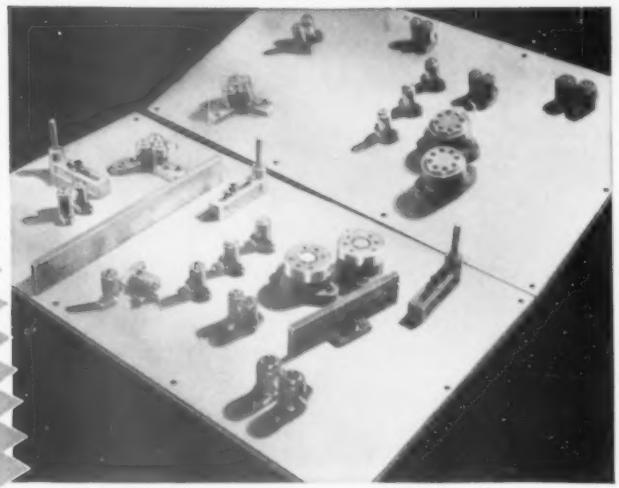
MAIN OFFICE AND WORKS

520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

Nothing can be

WHAT COULD BE SIMPLER FOR HOLE PUNCHING THAN

THE WALES PATENTED AND EXCLUSIVE TEMPLATE MOUNTING METHOD*



A template setup of Wales type "CD" Hole Punching Units ready to be mounted in stamping press.

One Important Application is in Combination with WALES Type "CD" Hole Punching Units

● Changing a setup of Wales Type "CD" Hole Punching Units with Patented Pilot Pins *only* requires removing the pair of operating templates from the press and replacing them with the next complete setup. With these templates, setups of Units are made outside the press and are ready to operate when bolted to die set. *Press "down time" is only a matter of minutes.* No adjustments are required between Units in the press.

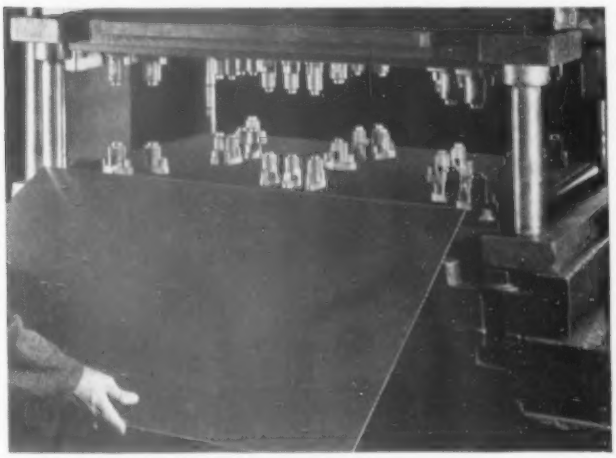
Uniform shut height of Wales Type "CD" Units provides an unlimited interchange of setups with only one ram adjustment.

PATENTED Wales Type "CD" Units eliminate the customary expensive and time-consuming methods formerly associated with building a die to punch a multiplicity of holes by:—eliminating special stripper plates, punches and dies...simplifying die design and die making...standardizing punches, dies and stripping mechanisms...reducing setup time...reducing investment in tooling inventory...reducing die storage space to a minimum...permitting setups to be made outside the press...reducing die maintenance costs by providing interchangeable parts for all standard units...releasing experienced die setters for other work...providing low initial costs.

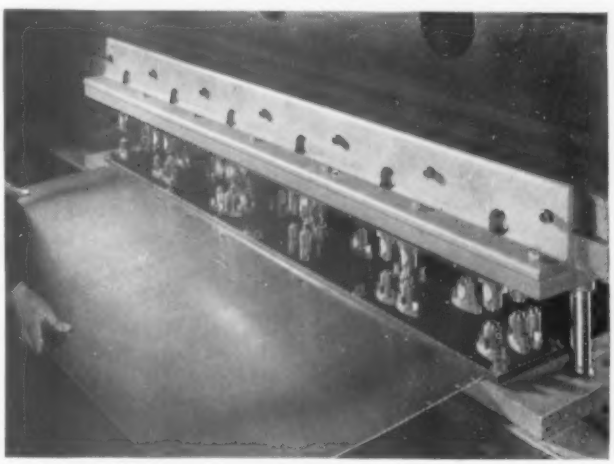
Tooling with Wales Equipment is reduced to a simple, quick assembly operation.

The simplicity and economies of Wales Equipment are too BIG a story to tell on this page so write for fully illustrated, functionally-colored catalogs.

***NOTE: The Wales-Strippit Corporation has not granted permission to anyone to use this patented mounting method except with Wales Hole Punching and Notching Equipment.**



Showing a template setup of Wales Type "CD" Units in stamping press. Note the work in foreground.



Scattered, staggered and straight line hole punching patterns may be quickly, easily and economically put in operation with Wales Type "CD" Units mounted on templates

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, President

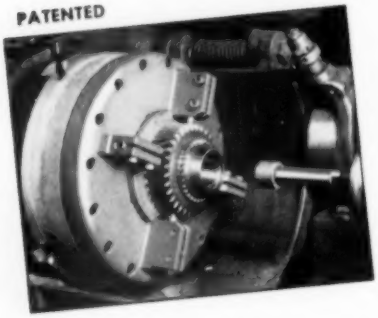
393 PAYNE AVENUE, NORTH TONAWANDA, N. Y.

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

DIAPHRAGM CHUCKS

PATENTED



Look, a high speed, precision chuck with no parts to wear out! ***Result:*** Maximum accuracy, minimum maintenance! ***Because*** the Woodworth design assures the ultimate in concentric chucking. ***Obviously***, it will solve your precision chucking problems, as it has already for large manufacturers of gears and other production parts. Send your precision chucking problems to us—at no obligation.

MECHANICALLY OR AIR OPERATED

ACCURACY YOU CAN TRUST

WOODWORTH

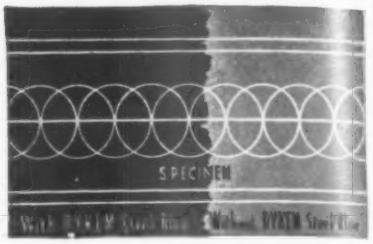
N. A. WOODWORTH CO., • SALES DIVISION

1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2303D North 11th St., St. Louis 6, Mo.
In Canada: 2466 Dundas St. West, Toronto, Ont.

DIAMONDS FOR WHEEL DRESSING TOOLS

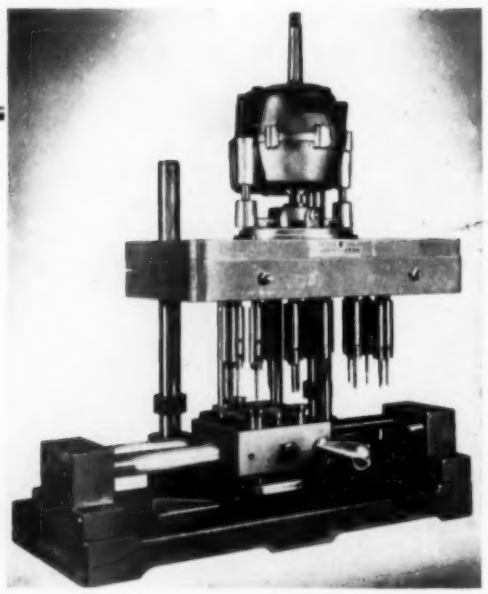
DIAMONDS FOR THREAD GRINDING TOOLS

DIAMONDS FOR ALL INDUSTRIAL PURPOSES

KOEBEL

Koebel Diamond Tool Co., 9456 Grinnell Ave., Detroit 13

TAILORED TO YOUR SPECIFIC PRODUCTION NEEDS



Ettco-Emrick **MULTIPLE HEADS**

for mass drilling and tapping of small parts

These units are engineered to give you *any production you require* in the drilling or tapping of your particular small parts. They provide, not just a multiple head, but a complete unit, including the work holding fixture—all tied together like a punch and die ready to set up on your drill press—a matter of a few bolts.

Tooling cost is low because the units are made of standard parts adapted and assembled to meet your needs. And this cost is only a temporary outlay because you get it back quickly in increased production and reduced labor.

BULLETIN 31 GIVES FULL DETAILS about Ettco-Emrick Multiple Head and Fixture units and includes many examples of the work done by these units. Write for a copy today.

ETTCO TOOL CO.

593 Johnson Avenue, Brooklyn 6, N. Y.

Boston, Mass. - Portland, Conn. - Detroit, Mich. - Chicago, Ill.

Over 25 years specialization in solving industry's drilling and tapping problems

ONE CUTTER FOR THREE CLASSES OF WORK!

Switch to another set of standard solid carbide blades and use this body for any face milling job on any material. Here are features and simplicity tool men like—easy blade interchange, no threads in the body, wedges behind the blades to take the shock and spare the body . . . Blades properly ground for various classes of work are stocked by Super and ready for immediate shipment. See Super Tool Company's Standard Carbide Tipped Tool Catalog No. 47. If you need a copy, write for one today.

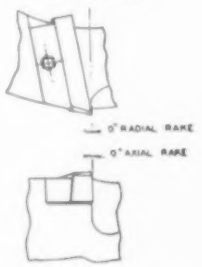
Aluminum!

Dural, Magnesium, Plastics, Etc.

Steel!

Cast Iron!

Brass, Malleable Iron, Etc.



STANDARD AND SPECIAL **SUPER** *Carbide Tools*

SUPER TOOL COMPANY

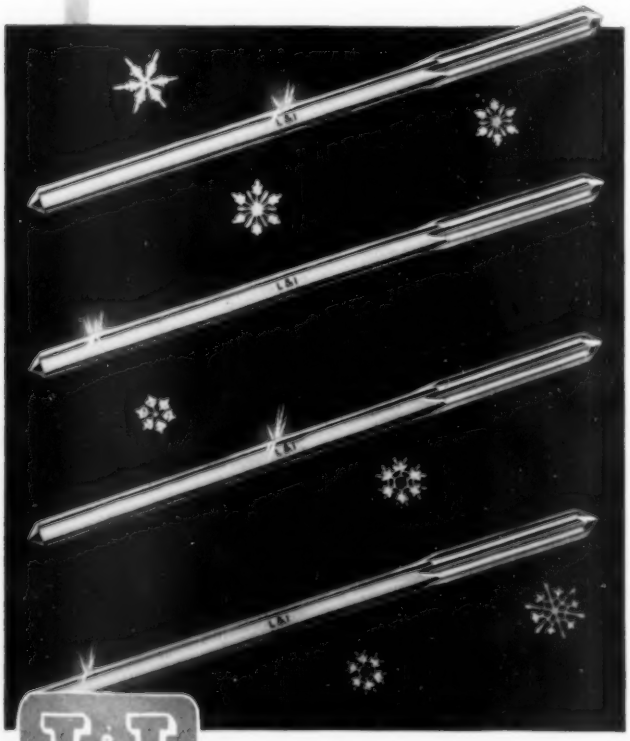
21650 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Glendale 3, California

Flawless

With every turn, L & I Reamers cut true to line . . . finishing off to make each job inspection-proof.

So they can do this, all L & I Reamers are made from solid, pre-treated bar stock . . . keen cutting edges are ground, not milled . . . flutes allow full chip-slippage. Then, dimension control is tighter . . . edges stay sharper . . . production life lengthens.

80



L&I

Reamers GROUND FROM THE SOLID

LAVALLEE and IDE, INC., CHICOPEE, MASS.

Ledeen CYLINDERS ARE GOOD CYLINDERS

Clamping work in a vise takes time and effort.

Ledeen Heavy Duty Cylinders actuate vises; avoid fatigue; speed work.

Send for Bulletin 453

Push or pull, tilt or turn, lift or lower, open or close, press or squeeze.

Available from stock

ENGINEERING PRODUCTS CO.
LEDEEN MANUFACTURING DIVISION
1604 SAN PEDRO • LOS ANGELES 15, CAL.

Fine Tools for the Toolmaker

The *MILWAUKEE* PROFILE GRINDER

is designed for the precision grinding of hardened steel parts for dies, jigs and fixtures. It is adapted to the grinding of curved and irregular contours, internal or external. Grinding wheels at end of vertical spindle revolve at 20,000 R.P.M.; reciprocate 1/8" vertically, 100 times per minute.

The *MILWAUKEE* DIE FILER

companion machine, is built for precision, straight-line, sharp corner filing, sawing and lapping . . . particularly in the softer metals, preparatory to hardening.

YOU NEED BOTH . . .

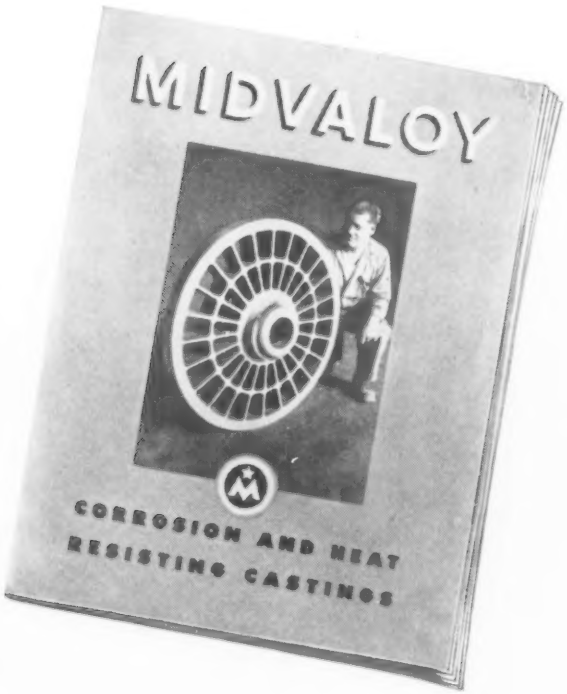
of these machines to handle a full range of Tool, Die, and Machine Shop work efficiently, at low cost. Write for illustrated bulletins.

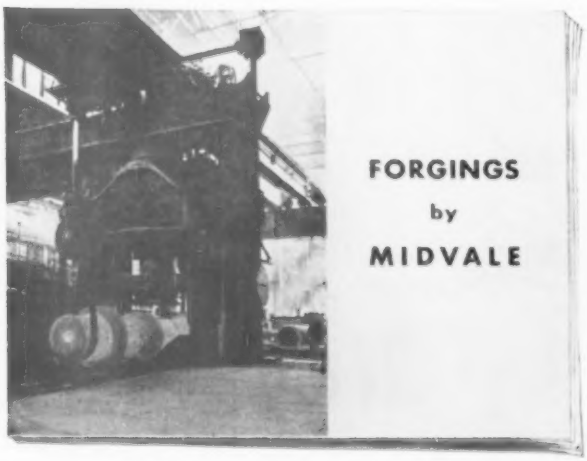
Both Machines are Stocked and Sold Exclusively by Industrial Machinery and Mill Supply Distributors.

Milwaukee
CHAPLET & MANUFACTURING CO.
1045 S. 40th ST., MILWAUKEE 4, WIS.

ALL ABOUT FORGINGS, STAINLESS CASTINGS, TOOL STEELS

Midvale's three new descriptive catalogs on Forgings, Stainless Castings and Tool Steels are required reading for 1948. The best way to start the New Year—ask for copies of the catalogs which will interest you. They are new, complete, full of up-to-date information on *custom steels.*





THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

OFFICES: NEW YORK • CHICAGO • PITTSBURGH
WASHINGTON • CLEVELAND • SAN FRANCISCO

MIDVALE

Custom Steel Makers to Industry

STAINLESS AND TOOL STEEL BARS

•

CORROSION AND HEAT RESISTING CASTINGS

•

FORGINGS AND RINGS

TAPPING TIPS

From Woody Spencer's Notebook

WELL GREASED PANS AND WELL GREASED TAPS TURN OUT BEAUTIFUL JOBS

Happened in the kitchen the other day when m' wife was doin' the Christmas bakin'. Noticed how careful she was when she greased the pans and what beautiful stuff those well greased pans turned out—no sticking, no crumbs, just smooth, clean, appetizing loaves and cakes. O' course, it got me thinkin' about taps and what a beautiful job you can do with a well lubricated tap. Only difference is, different materials need different lubricants. But that's easy. My Handy Tap Guide tells you just what kind o' lubricant for every kind o' job. Usin' it you can be pretty sure o' turnin' out a beautiful tappin' job. Send for one and try it!

These tapping tips of Woody's are not intended as any technical advice on tapping. They're just random thoughts, hints and short cuts Woody has gathered in his years around the shops. He is passing them on in the hope that they will help smooth out some routine job so it will go easier and faster.

For the specific problems that frequently come up, consult our engineers. Send in complete data on the job—material, depth, diameter, lubricant, whether the hole is through or blind. Our engineers will be glad to make recommendations without obligation.

Note — Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Look for them.

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company

Cleveland 3, Ohio

60 YEARS MANUFACTURING

Multiple Spindle Drilling and Tapping Machines—Automatic Drilling and Tapping Units—Multiple Spindle Attachable Drill Heads—Hot and Cold Swaging Machines—Hammering Machines—Tools, Jigs & Fixtures—Contract Work—Special Machinery.

Langelier Manufacturing Company
PROVIDENCE 7, RHODE ISLAND

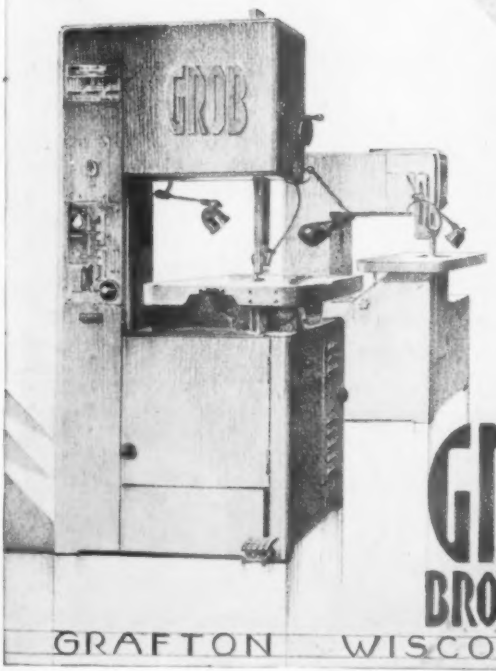
have we your right address?

if you've moved, notify ASTE headquarters of your new address so that THE TOOL ENGINEER and other Society information will reach you promptly. Write your NEW and OLD address on a penny postcard and mail to:

American Society of Tool Engineers
1666 Penobscot Bldg., Detroit 26, Michigan

Also, advise headquarters immediately if you changed your position or place of employment.

SAWING FILING



GROB BROTHERS

GRAFTON WISCONSIN

15 seconds 30 seconds 12 sec 23 seconds 12 seconds

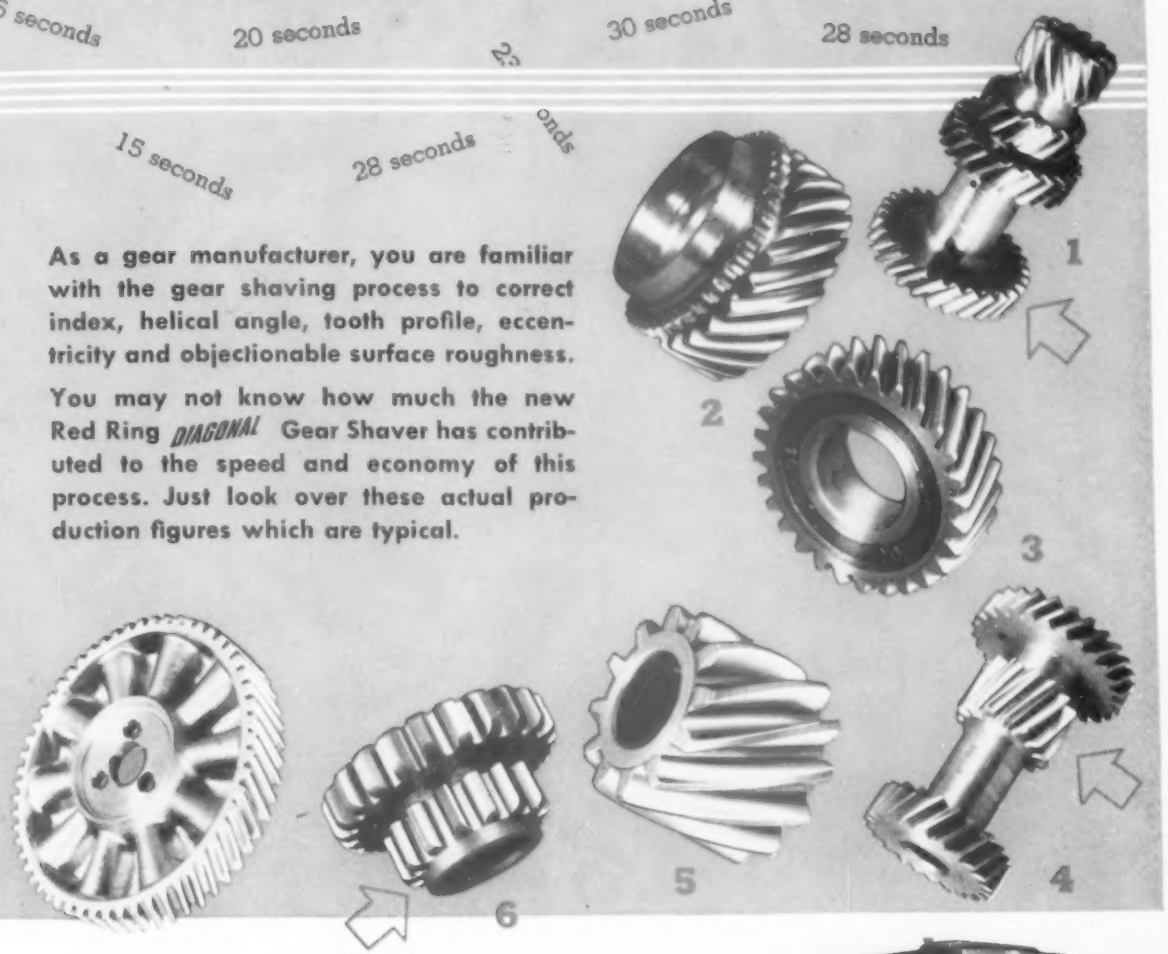
Actual Gear Shaving Production Figures

25 seconds 20 seconds 30 seconds 28 seconds

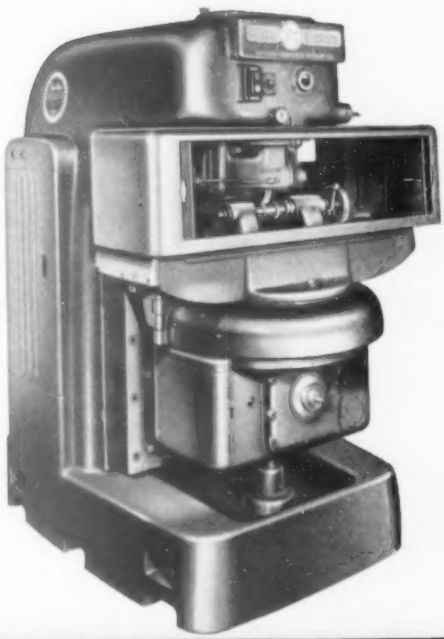
15 seconds 28 seconds onds

As a gear manufacturer, you are familiar with the gear shaving process to correct index, helical angle, tooth profile, eccentricity and objectionable surface roughness.

You may not know how much the new Red Ring *DIAGONAL* Gear Shaver has contributed to the speed and economy of this process. Just look over these actual production figures which are typical.



Gear	Material	Dia.	Face	Teeth	DP	Stock Removed over Pins	Machine Time
1	Steel	4"	$^{11}/_{16}$"	29	9.25	.010"	30 seconds
2	Steel	$3^{5}/_{16}$"	1"	23	10.5	.010"	23 seconds
3	Cast Iron	$2^{5}/_{16}$"	$1^{1}/_{16}$"	28	10	.010"	20 seconds
4	Steel	$2^{1}/_{4}$"	$1^{3}/_{8}$"	14	7.6	.009"	28 seconds
5	Steel	$1^{1}/_{8}$"	1"	12	13.5	.005"	9 seconds
6	Steel	$2^{9}/_{16}$"	$^{11}/_{16}$"	14	6 8	.006"	15 seconds
7	Aluminum	$6^{1}/_{2}$"	1"	56	10	.010"	25 seconds



SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

For further information write for Bulletin S47-3 or, better still, consult a Red Ring Engineer.

NATIONAL BROACH AND MACHINE CO.
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

Are Your Fixtures Out of Production

While they are returned to tool room for replacement of worn or broken rest buttons and locating pins? If so, increase your productive efficiency by using—

"Q-C" RETAINERS REST BUTTONS
LOCATOR PINS

RETAINER & REST BUTTON ASSEMBLY

RETAINER & LOCATOR PIN ASSEMBLY

Only a wrench and a moment's time to remove and replace. Four types—round, round relieved, diamond, diamond relieved. Four sizes each type. Send for chart and secure the advantages they offer.

Q-C ENGINEERING PRODUCTS, 2842 W. GRAND BLVD. — DETROIT 2, MICH. — TR. 1-4400

Rotary Index Tables
Rectangular Index Tables
Standardized Jigs and Fixtures
Fixture Locks
Fixture Units
Jacks
Guide Bars
Vises
Etc.

Send us part prints for suggested applications—No obligation.

TO STANDARDIZE IS TO ECONOMIZE

GAMMONS REAMERS★

Originators and Manufacturers of Helical Reamers and End Mills

Helical Taper Pin Reamers Shipped by Return Mail

The
GAMMONS-HOAGLUND
Company

400 MAIN STREET, MANCHESTER, CONN.

SCHERR *aids to precision*

Control the Job from Start to Finish with the WILDER PROJECTOR

New horizontal type for production inspection just out.

Throws a magnified shadow image of the part under inspection against an enlarged drawing of part. Magnifications available, 10x to 200x. Horizontal work table for flat work. Center support and micrometer cross slides for checking forming tools, screw threads, hobs, etc. Eliminates all errors due to "feel." May be speedily operated, with little or no experience. Prevents costly errors and insures correctness from the start of a production run. Can be equipped with a new circular type of Surface Illuminator.

THE SCHERR MAGNI-RAY

An invaluable inspection tool. Magnifies the work under inspection, floodlights it as well, and gives the immense advantage of "two-eye seeing." No wonder thousands of Magni-Rays are serving in large inspection departments, and other thousands on precision machines or critical toolroom operations. The lens is ground by experts for true magnification. Heavy base permits swinging lens to any position, any height to 14 in. Three types—Model A, 3" lens, 1½x plus. Model B, 3x plus. Model C, 5" lens, 1½x plus.

GAERTNER TOOLMAKERS' MICROSCOPE

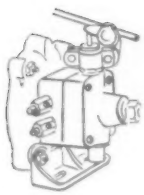
For rapid precision checking of critical dimensions, angles, contours, etc. A scientific instrument with the rugged strength of a manufacturing tool. Valuable in both toolroom and inspection department and absolutely required for thread inspection. You can see that last ten-thousandth with the Gaertner, or instantly spot the slightest deviation from correct angle. All eyes see it alike, too—no arguments. Any toolmaker can use it. Wide range of templets for use with the templet ocular head.

Write for full details on these Tools, and for the Scherr Small Tool Catalog

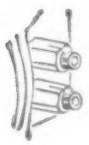
GEO. SCHERR CO., Inc. 199-A LAFAYETTE STREET NEW YORK 12, N. Y.

HOW THE BELLOWS AIR MOTOR *differs from* CONVENTIONAL AIR CYLINDERS

Bellows double-acting non-rotating BM-15 Air Motor



Quick, positive directional valve is an integral part of the cylinder



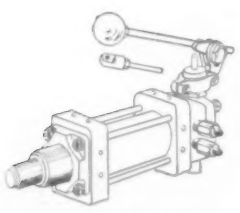
Speed control valves, also built-in, provide accurate control of traverse rate

Only one air connection required, which can be flexible hose

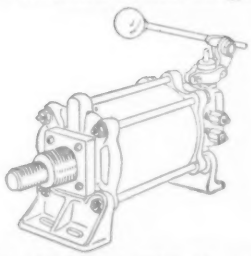
The Bellows Air Motor is a *different type of air cylinder*. It is a compact, reciprocating power unit, complete in itself. No extra directional valves or speed control valves are required. All controls are integral with the cylinder itself.

Its compactness, its simplicity of installation and operation, make practical the use of flexible, economical, "controlled-air-power" in an unlimited range of fundamental pulling, pushing and lifting movements.

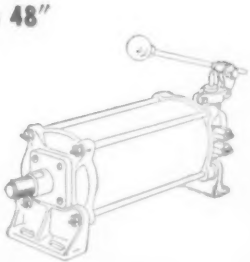
Four Power-rated Sizes
Manual, Mechanical, Electrical Valve Operation
All Standard Mounting Types • Standard Stroke Lengths 1" to 48"



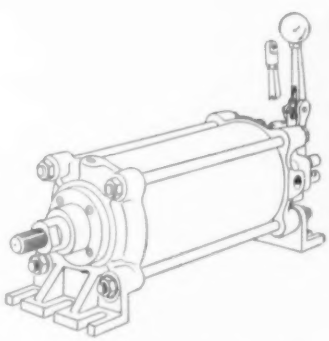
Model BM-1 (1¼" bore)



Model BM-5 (2½" bore)



Model BM-10 (3⅝" bore)



Model BM-15 (4½" bore)

Write for Bulletin BM22 and the new Foto Facts sheets showing cost-cutting installations of Bellows "Controlled-Air-Power" Devices.

The Bellows Co.
AKRON, OHIO

INCREASED PRODUCTION ★ BETTER WORK

with

Boyar-Schultz Screw Machine Tools

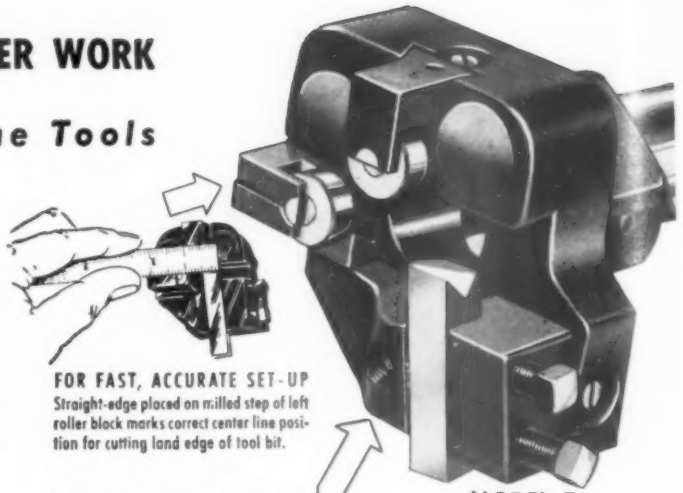
A Turning Tool with outstanding features that increase quality production and reduce down-time and rejections to a minimum.

Precision made from the finest steels, it is designed for very close tolerance work and made with the built-in strength to hold adjustments accurately through long runs.

An extremely easy tool to set up and adjust. After regrinding, the tool bit can be returned to holder in the same exact position with minimum lost time. The result—less downtime.

Available in 6 sizes, 000 to 3.

WRITE FOR NEW SCREW MACHINE TOOL CATALOG.



FOR FAST, ACCURATE SET-UP
Straight-edge placed on milled step of left roller block marks correct center line position for cutting land edge of tool bit.

Tool steel can be removed from tool bit holder, sharpened and returned to holder in the correct position with a minimum of down time.

MODEL T
TURNING TOOL

Model K Knurling Tool
In Three Sizes, 00, 0 & 2

Model DRH Adjustable
Drill and Reamer Holder
In Three Sizes

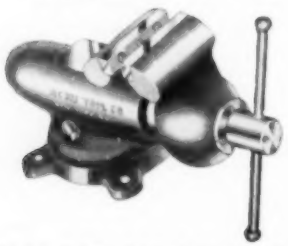
Model H Adapter
Made in Six Sizes

Model C Burnishing Tool
Made In Three Sizes,
00, 0 & 2

Model RS Revolving Stop
Made in 3 Sizes & 7 Lengths

BOYAR-SCHULTZ CORPORATION 2106 WALNUT ST. CHICAGO 12, ILL.

Practically.... Indestructible

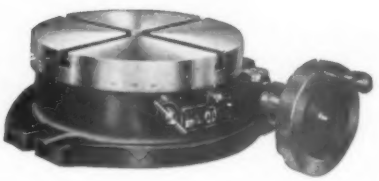


ACME BENCH VISES—Ruggedly Built Precision Made.....*offer you*

Longer Vise Life • Maximum Gripping Power
No Side Twist or Wobbling
Unbreakable Sleeve Nut • Interchangeable Jaws
11 Sizes from 2″ to 6″

Vise Head and Nut Castings are Malleable Iron; other parts are high tensile Semi-Steel Castings. Makes them practically indestructible.

Reduce Expensive Fixture Costs



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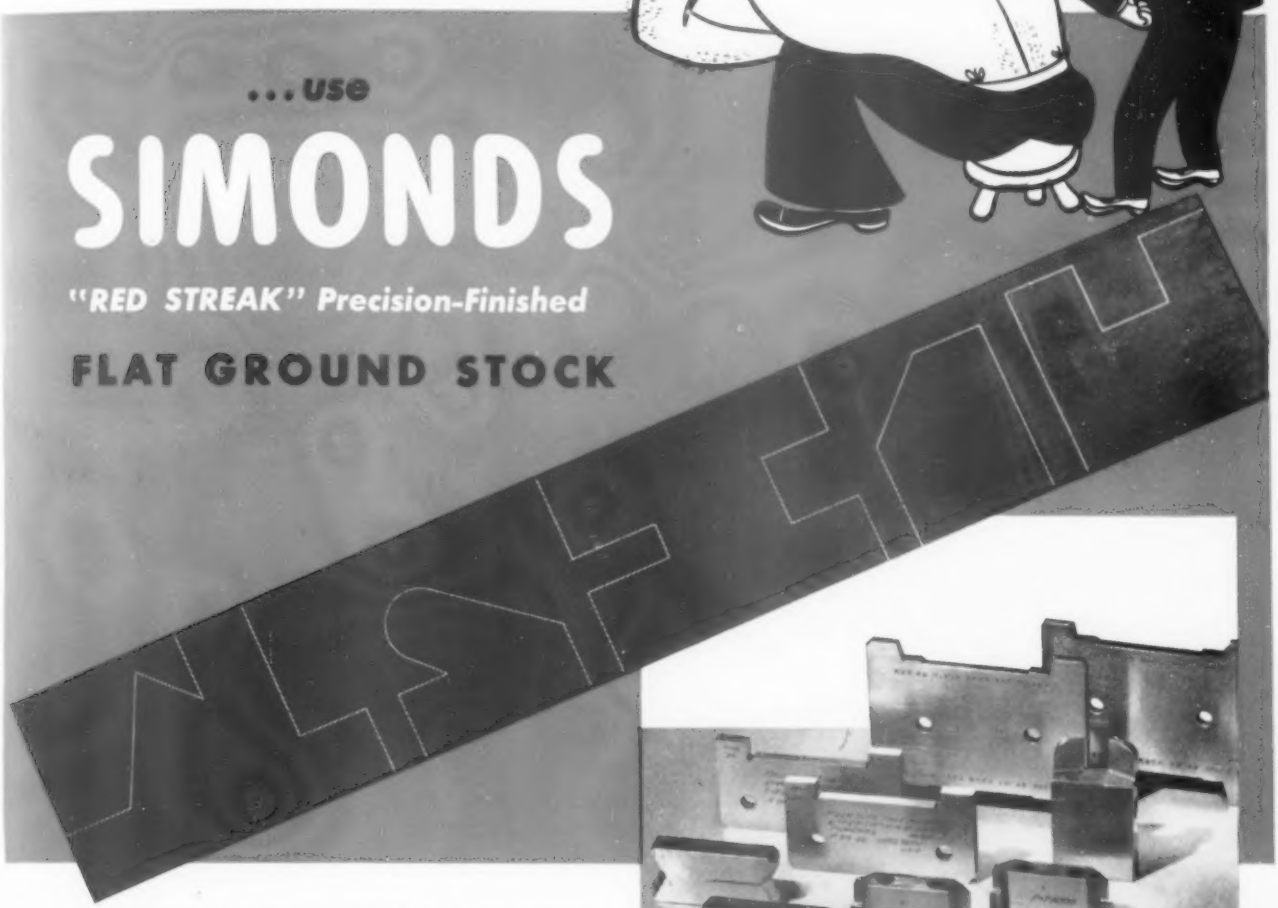

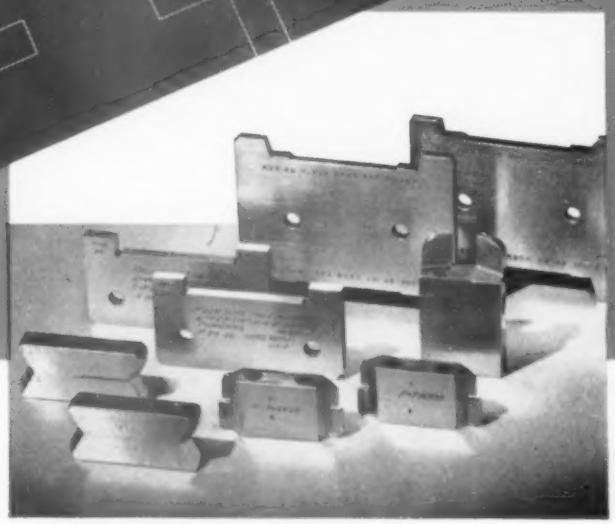

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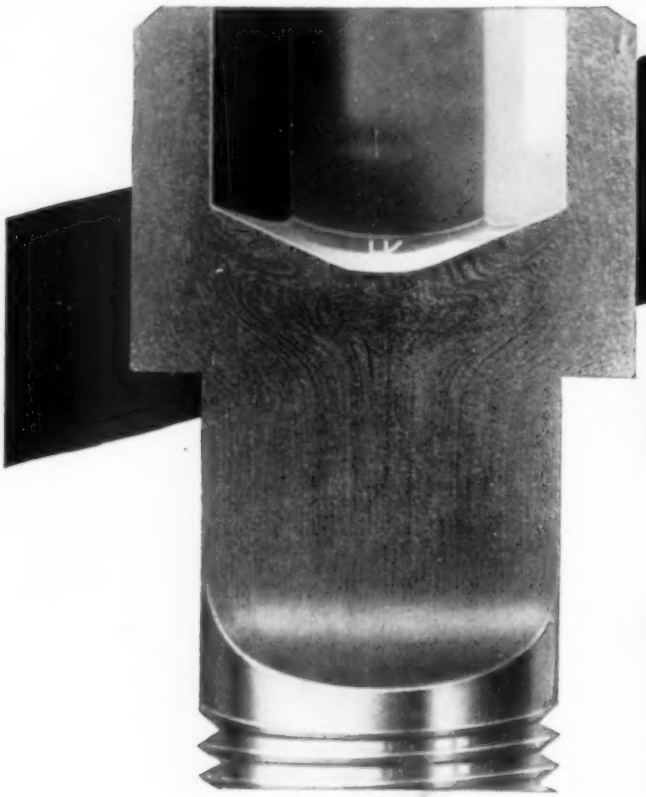

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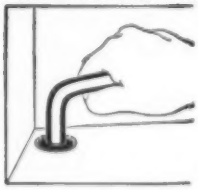

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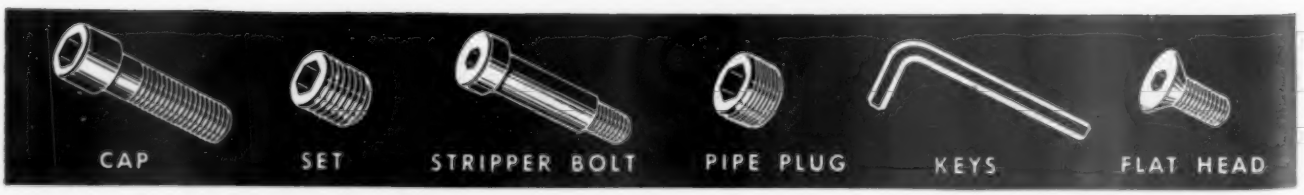
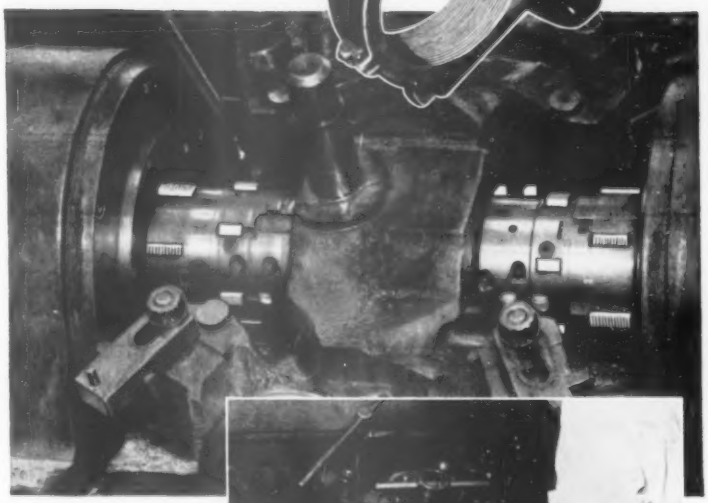


bore ream thread

IN *ONE* OPERATION



Photographs, courtesy of Eaton Manufacturing Co., Cleveland, Ohio.

The operation pictured here is typical of the practical economy made possible by the use of Murchey engineered tools.

The work piece is a truck differential carrier. It is assembled with both caps and machined on a double end unit equipped with Murchey special machine taps with rear pilots and forward boring and reaming heads.

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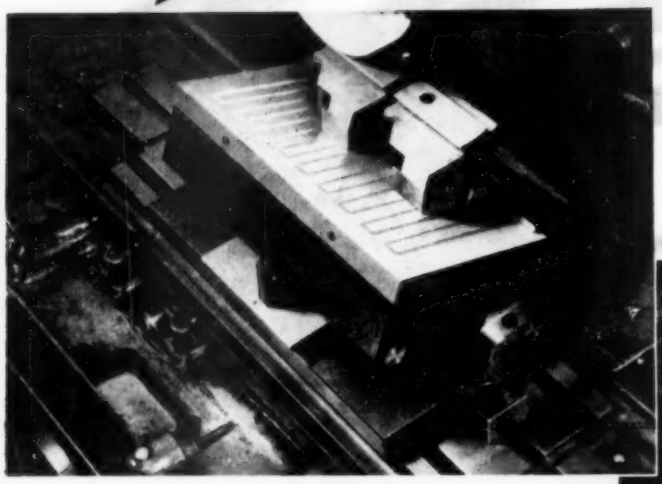
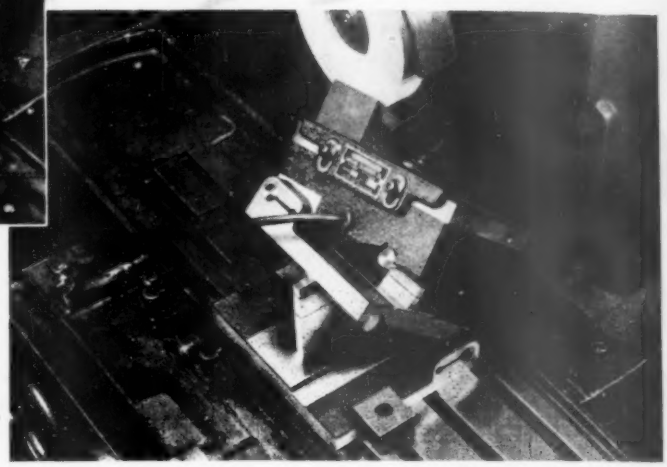


The single angle Magna-Sine for straight or single angle work.



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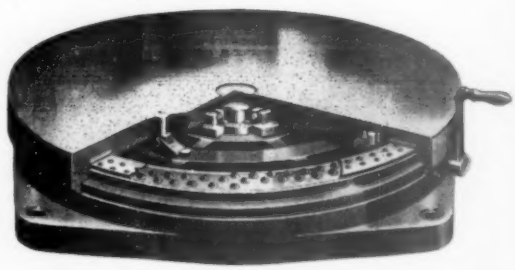

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